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Heat-Treating Ball Races by Machinery

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SEVENTY-FIVE tons of ball-race forgings are delivered by the forge plant of the New Departure Manufacturing Company to the heat-treating department every working day. All of these forgings pass through the annealing furnaces on their way to the several fabricating plants to be machined, and the majority of them return to the department for further treatment.

Cranes, conveyors, rotary furnaces, washing and drying machines, automatic tempering furnaces, revolving sand-blast chambers, and other mechanically-operated devices, comprise links in the chain of materials-handling machinery to expedite the progress of the work and reduce to a minimum the manual labor that would otherwise be necessary to keep the product moving. Electric trucks and tractors supplement the conveyor system in transporting the work to and from other departments.

The heat-treating department occupies a group of buildings apart from the principal fabricating plants, communicating with them by a long bridge over which all of the annealed product is sent for the preliminary machining operations, and over which most of it is brought back to be treated before being ground.

A comprehensive view of the principal building is given in Fig. 1, showing at the right, under the gallery, some of the pit furnaces in which the forgings are annealed; on the left, and at the far end of the building, a part of the conveyor system by which the machined races are picked up on their return from the fabricating plants and distributed in accordance with the treatment they are to receive; and on the floor, a number of the annealing pots in which the work is contained while undergoing the annealing process.

In the middle distance, at the right, are a screening machine to free the annealed forgings from sand, scale and dirt incident to the annealing process, and an inclined conveyor to carry them to the railed platform to be seen

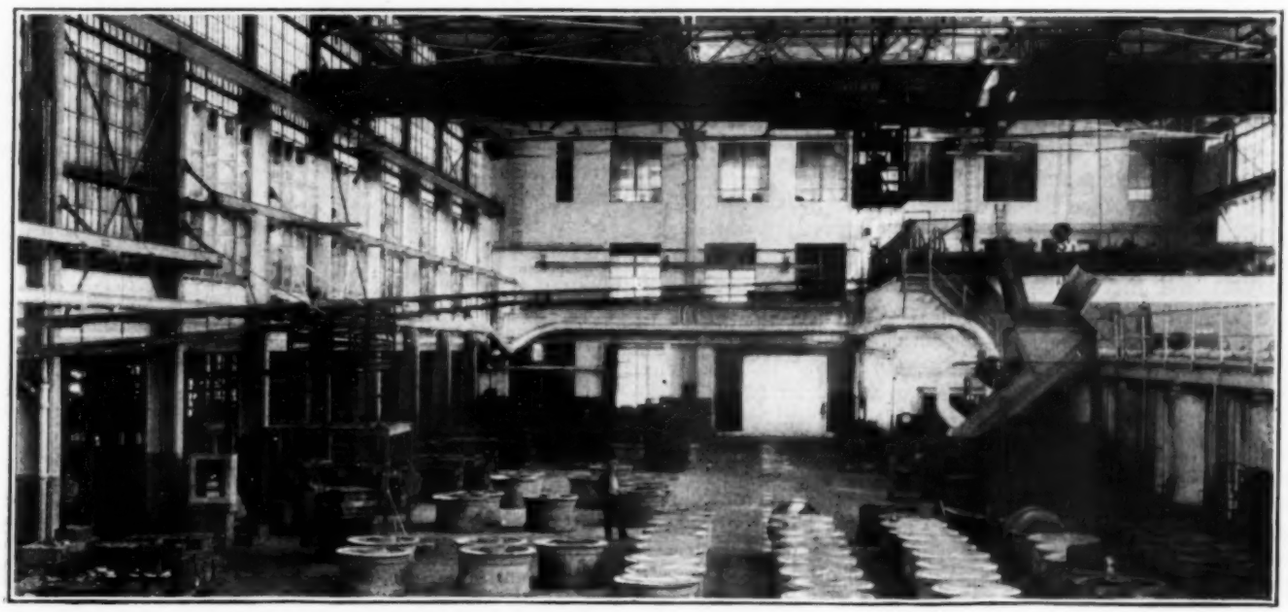


Fig. 1—The annealing room. Annealing pots are to be seen in the foreground

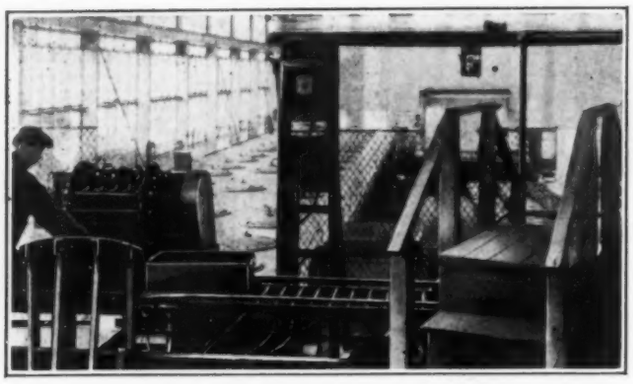


Fig. 2—The contents of the pots are dumped into the hopper of a screening machine and are delivered by conveyor to this platform, from whence they are taken by electric trucks to the machine shops. The tops of some of the pit furnaces may be seen at the left

in the upper right-hand corner. In Fig. 2, which is a view taken from this platform, the delivery end of the conveyor is shown in the foreground; in the middle distance, at the left, may be seen the tops of many of the pit furnaces; and in the remote background is the receiving platform where the forgings enter the building from the forge plant. Opening from the main floor—at the left in Fig. 1—is a one-story wing in which are located the automatic furnaces and other equipment necessary to the process. It is on the north side of the higher main building and is lighted mainly through green-tinted glass set in a monitor roof. Direct sunlight is therefore excluded, and the light, though ample for the efficient handling of the work, is of a quality that does not tend to falsify the color values of heated parts in the furnaces. Mercury-vapor lamps provide artificial illumination whenever necessary. Forgings are brought from the forge plant, a half-mile away, in automobile trailer trucks. They are conveyed in special iron containers of a size and shape to nest in the body of the trailer, and provided with rings at the sides to attach them to a crane conveniently. The receiving platform mentioned in the preceding paragraph is raised some ten or twelve feet above the main floor, but is at the street grade, so that the trailers may easily be run into the building and under the crane.

The containers are lifted one at a time by the crane and their contents are dumped into the annealing pots—an operation requiring no manual effort except to steady the load and tilt the container at the proper moment. The pots are circular in shape, having annular chambers surrounding the central, hollow cores. Shallow annular grooves surround the tops of the cores and the outer edges of the pots, to contain sand in which corresponding flanges of the covers are embedded to seal the pots and exclude oxygen during the time the charge is under heat.

Special slings to hook under the flanges of the annealing pots allow them to be readily attached to the crane, and by it deposited in the pit furnaces. Each furnace accommodates three pots, stacked vertically. The furnaces are oil-fired by burners easily accessible beneath the gallery. Unloading and recharging are usually done at night to avoid interference with other work. The work is allowed to cool partially in the furnaces, and when taken out, the pots are allowed to remain on the floor until cold.

To dump the contents into the hopper of the screening machine, a bail is clamped around the pot below the flange, and the main hoist of the crane is hooked to it. A chain suspended from the auxiliary hoist is then passed up through the hollow core from the bottom, and hooked over the edge at the top. By lowering the main hoist, while holding the auxiliary, the pot is easily inverted over the hopper. The hook-up is shown in Fig. 1, wherein a pot may be seen in the process of dumping.

Passing through the screening machine, the forgings fall upon a power-driven conveyor that carries them to the elevated platform and discharges them into metal pans—as shown in Fig. 2—upon a gravity conveyor by which they are delivered to electric trucks to be transported to the fabricating plants. Oil-hardening steels—which constitute the larger part of the product—and the low-carbon alloy steels that are to be carburized after machining, go to different departments to be machined.

The platform is the terminus of the bridge that connects the heat-treating department with the fabricating plants, and constitutes a clearing house from whence the various classes of product are despatched. It is also the receiving platform to which the machined forgings are returned by the same trucks, to resume their progress through the heat-treating processes over another section of the conveyor system.

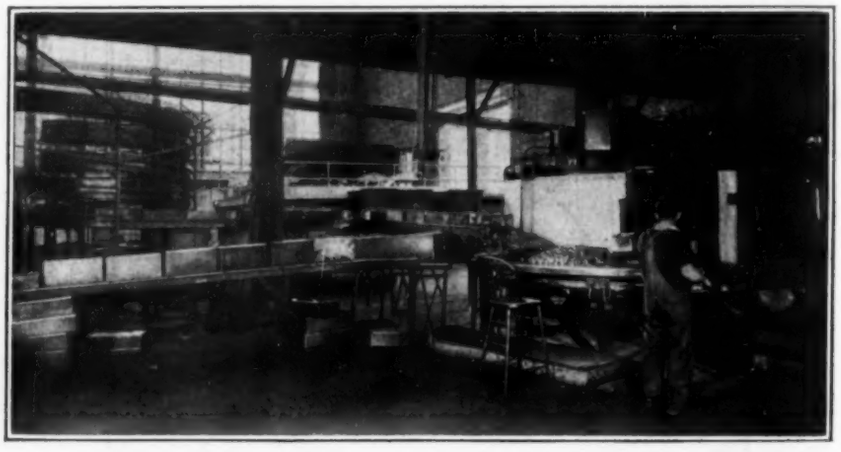


Fig. 3—This rotary, electric furnace is itself a conveyor. The charging door opens automatically at stated periods and the heated work is delivered through an opening in the bottom of the furnace to an oil-tank below, in which there is a constantly running conveyor

The work is transported at this stage in metal pans of convenient size and weight of contents to be handled manually. Two runways of the gravity conveyor which can be seen on the left and at the far end of the building in Fig. 1, start from this receiving platform and extend throughout the length of the building, being provided with switches at the several points where the work is to be diverted to the various operations.

Pans containing ball-races of mild alloy-steel to be carburized selectively, are shunted midway of the length of the runway into the helical section of the conveyor to be seen at the left in Fig. 1, and are lowered by it to a straight continuation that leads to the left and into the furnace room. Switches in this part of the conveyor

divert the pans to their several destinations, one of which is the plating room where the parts are prepared for selective carburizing. Pans containing product that is to be quenched in oil, are intercepted at the second switch and are lowered by a similar helical conveyor, from which they are discharged upon the apron of the rotary furnace to be seen in Fig. 3, for the first of two heats to which this material is subjected. This view was taken in the furnace room, looking toward that part of the building shown in the preceding illustrations. The platform from which Fig. 1 was taken, may be seen in the background, with one of the trailer trucks upon it. The operator of this furnace dumps the ball-races on the apron of his furnace and places the empty pans upon the conveyor at his left, to be carried to points where pans are needed. The product itself is transported, independently of containers, by the mechanisms of the automatic furnaces to the several machines incidental to drying and freeing it from scale, and by power-driven conveyors to the point where it is again ready to be deposited in pans and sent out of the department.

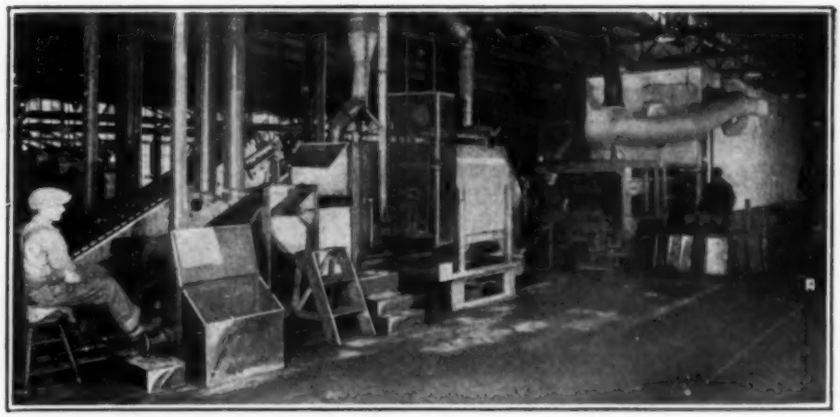


Fig. 5—At the left in this picture is the conveyor from the second oil tank. Near the center is the washing and drying machine, and at the extreme right is an automatic electrically heated tempering chamber through which the work passes on another conveyor

The furnace shown in Fig. 3 is circular in shape, having a continuously-rotating hearth driven by an electric motor, through the reducing and timing mechanism to be seen on top of it, which mechanism also opens and closes the charging door at periodic intervals. The charging door is directly before the operator in this view, and is here shown partly open. A door at the operator's right indicates the discharging point. This door is not ordinarily opened, as the heated ball-races are discharged automatically through a chute inside the door. The chute leads directly to an oil-quenching tank located below the floor level. The hearth of the furnace rotates to the left, so that its charge nearly completes the circuit of the heating chamber to reach the discharging point.

The furnace charges are determined by weight. A small platform scale to be seen on the apron is adjusted to the desired amount, and each charge is weighed thereon. This method assures that a definite amount of cold metal will enter the furnace at each interval, without regard to the size or weight of individual races, and relieves the operator of the duty of counting out a specific number and of measuring the size, or consulting a table, whenever the character of the work is changed.

The long-handled implement with which the operator is equipped, is a metal frame which rests upon the apron. Into it he dumps the weighed charge, and, when the door is opened for him, he pushes it onto the hearth of the furnace, lifts it from the charge by means of the long handle, and withdraws it before the door closes. This is all that the workman has to do with the operation. The furnace is heated electrically by units arranged in two zones. Temperatures are controlled, indicated and recorded by electric devices located in the brick-enclosed room to be seen in Fig. 4, at the left. The temperature of the first zone, adjacent to the charging door, is maintained at about 50 deg. F. above the desired quenching point, in order to counteract to some extent the effects of the periodic introduction of cold metal and the inflow of cold air when the door is opened. The rotation of the hearth is so regulated as to give each charge ample opportunity to become heated thoroughly by the time it has completed the circuit of the chamber. The charges are introduced as short intervals, so that there are always several charges in the furnace, the exact number depending upon the diameter of the hearth and the duration of the cycle. At the bottom of the oil tank into which the heated ball-races fall from the furnace, there is a slowly moving power-driven conveyor, which rises in an incline at the end of the tank to the level of an-

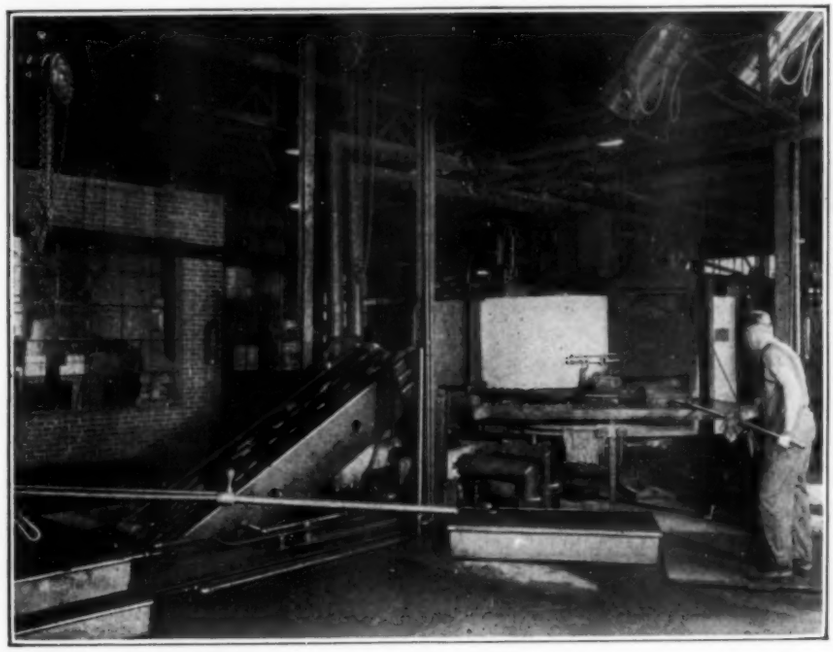


Fig. 4 — All oil-quenched parts go through a second treatment in this furnace. The conveyor from the first oil tank may be seen at the left delivering work to the apron, and a similar equipment below the furnace delivers it to the hopper of an automatic washing and drying machine

other furnace—to be seen in Fig. 4—which is a duplicate of the first one. The operation conducted therein is the same as in the first one in every respect, except that a slightly lower quenching temperature is maintained. This furnace is also provided with a quenching tank below the floor, and a conveyor to carry the work to the next stage. The location of the open tanks at floor level, makes it necessary to guard them. The wooden steps to be seen in Fig. 4 are bridges to cover the tanks and provide a passage across them. The almost constant discharge of red-hot parts into the oil would soon raise its temperature to the danger point, if measures were not taken to cool it, hence there is in an adjacent building, a refrigerating plant to circulate cold brine through coils of pipe in all of the quenching tanks in the department. From the second quenching tank, a similar conveyor deposits the hardened ball-races in the hopper of a machine to be seen near the center of the picture in Fig 5. Passing through this machine they are washed and dried, and fall into wire baskets that are then hung upon the upper section of another conveyor. This conveyor is a part of the electrically-heated automatic-tempering furnace, through which the baskets of work are conveyed and are then returned to the starting point.

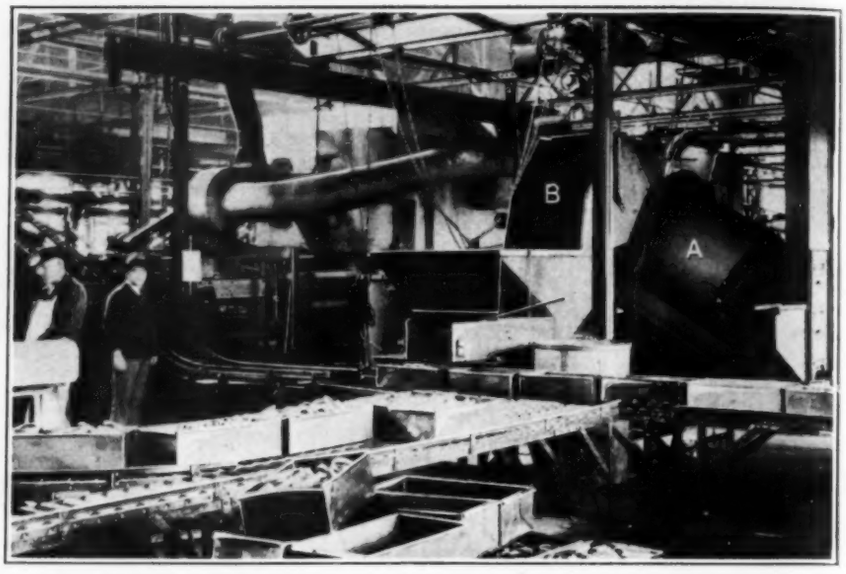


Fig. 6—The tempering chamber may be seen in the background. At the right is a rotary sand-blasting machine, and in the center a hopper into which all work is dumped, preparatory to raking it into pans and sending it to the left over the conveyor to the grinding department

Just across the aisle, to the right of the tempering furnace, is a row of revolving sand-blast machines, one of which may be seen at *A* in Fig. 6, into which the now tempered ball-races are placed. The chamber is closed at the top and is provided with a suitable charging door. On the side, near the bottom of the inclined chamber, is a covered opening through which the charge is removed. The chamber rotates slowly while the contents is subjected to the scouring action of the sand jets as they are tumbled about.

When a charge is ready to come out, the machine is stopped, the cover is removed from the side opening, and the chamber is turned to allow the contents to fall into the dumping bucket *B*, which at the moment occupies a pit beneath the machine, with its sides level with the floor. The filled bucket is then raised by means of an electric hoist to the position shown in the illustration, at which time its contents will have been discharged into the hopper before it.

The photographs from which Figs. 3, 4, 5 and 6 were made, were taken from points approximately at the center of an area around which the product is passing on one side, and the empty pans on the other. The pans arrive on the runway, from the right—on the same conveyor on which the operator in Fig. 3 placed them. Here, as shown in Fig. 6, two separate lines intersect. The oil-quenched and tempered ball-races, raked from the hopper into pans on the conveyor before it, are given a push to the left and are carried by the inclined power-driven section of the conveyor to the grinding department.

Carburized parts coming from another part of the furnace room, pass through the sand-blast machine, and through the tempering chamber. They are dumped into the hopper and raked into pans as before, but the pans are placed on the short conveyor to be seen in the foreground, and pass to a bench on the left for test and inspection of the contents. From this bench, they return on the other part of the same conveyor and are transferred by hand to the main line, on which they are carried up an incline, and so to the grinding department as in the case of the oil-quenched ball races.

What They Are Doing in European Shops

Four weeks ago we published the first set of observations on European shop practice made by one of the editors on a special trip. That one concerned England. This week we are running the second set—on French shops, mostly automobile. Following this, at two-week intervals, will be similar articles on Switzerland, Germany and Czechoslovakia. One of the important points brought out in the articles is the high esteem in which American methods and equipment are held.

How Much Interchangeability?

IT WAS just an accidental luncheon party. Jim Aikens had run into Frank Watson on the street, and as they walked toward the Business Men's Club they overtook our free-lance consultant, Bill Holland.

"Come along with us, Bill," said Aikens, "I want to talk over a number of things with you. One of them has to do with the big press I bought of Watson a few years ago."

"What's wrong with the press, Jim?" asked Watson after they sat down.

"Nothing but just natural wear, Frank. I'm not kicking about the machine, but the way you build it—or don't. When the clutch block wore until it made too much noise I sent over to your place to get one that would slip into place and let us start the machine up next day.

"Instead of sending one right over, your people wanted to know the exact size of the hole where the block slides. We had to lay up the press, take out the clutch block and let them get exact measurements. Don't you make machines that are interchangeable, Frank?"

"Yes and no, Jim. Our shafts are interchangeable, and it's the same with a number of other parts. But it's a different proposition with that clutch block, Jim."

"I don't see why, Frank."

"That's because you make small stuff, Jim, and make it in large quantities. You can tool up for all your operations and keep things to size. If I tried to make the clutch block holes to a definite standard, close enough to be interchangeable, you'd think I was robbing you when I told you the price of the machine."

"But doesn't standardization reduce the cost of machines, Bill?" And Jim turned to Holland.

"There's a lot of misunderstanding on standards and interchangeability, Jim. As Frank told you, it's the proper plan on your work. But I happen to know about that clutch block job. The hole in the shaft is a slotter job, and it would be foolish to hold them all to the same tolerance as some other parts. The cost would be very high.

"Then, too, you must remember that both the hole and the block wear in service, for they get a wallop every time the clutch goes in. Even if they were interchangeable when new, you couldn't put a new clutch block in the worn hole and expect it to fit."

"Then why all the talk about interchangeability, Bill?"

"Interchangeability is O.K. on a lot of work and on some parts of most machinery. But a man wants to use horse-sense about it as with everything else.

"The automobile builders make nearly everything interchangeable within reasonable tolerances. But when it comes to piston fits in the cylinders every last one of them selects the piston that will give the right clearance in the bore. If they rejected all cylinder blocks with bores that were not exactly the same diameter, within their tolerance, you'd pay a lot more for a car than you do now.

"They all select pistons and piston pins, and some select the bearings for the crankshaft and rods for the crankpins. I agree with Frank that there are some parts that do not need to be interchangeable, although I know some who insist that it's just as easy as making them for a selective fit."

"You've given me something to think about, Bill," said Aikens. "Fact is you generally do. You've added quite a chunk to my education, the lunch is on me."

Executives are invited to discuss the problem involved in the foregoing case. Accepted contributions will be paid for.

Discussion

Too Much Inspection

Modern quantity production methods have evolved many unusual viewpoints, not the least of which is the production complex in inspection. Surrounded by a sea of units of production, the

Discussion

inspector has been looking around for a yardstick by which to measure his success. The only tangible evidence of his work is the pile of daily rejections. Unconsciously, he has set out to match the ever increasing daily total of units of production with his own total of units of rejection, feeling that an increasing total spells success.

This attitude follows naturally as a consequence of his earlier training as a mechanic and his intimate contact with the production department. Of course, the attitude is wrong. The inspector is an outpost of the engineering department, charged with the same responsibility of a satisfactory product at a minimum cost. To get him away from the mechanical routine, where a product either conforms to the drawing or doesn't, and inspire him to think, so that he will look ahead to see whether the assembly will or will not function, is a big undertaking.

Giving an inspector the right to accept a deviation which he believes is O.K., or if he is in doubt, the routine means of referring it to an engineer for decision, helps some. Encouraging him to comment on a drawing if he believes it ambiguous and liable to lead to error, is another way of building up his confidence in his judgment. Permitting him to vary the number of inspections on a given job within reasonable limits also aids. Giving him full opportunity to justify a rejection and never arbitrarily overruling him is showing the respect to which he is entitled. And greatest of all helps is the simple one of regarding him as a friendly assistant who is just as anxious to build up the daily output of good products as any other man in the plant, rather than as a hostile interloper who is to be fought every step of the way to maintain production.—WILLIAM W. DAY.

A Question of Family Income

As a machine shop superintendent for many years, I cannot agree that George Carey or his firm should carry the dismissal of Ed Smiley as a load upon their conscience. It is simply a matter of circumstance, an every day happening, and unavoidable. No one enjoys dismissing a worker, whether good or bad, but firms are not institutions for maintaining family incomes. The superintendent cannot hesitate in a matter of this sort. He obtains his position and can hope to be successful only by doing everything within reason to cheapen production.

Of course, every one would welcome a way out of difficulties of this sort. We should all like to see some method introduced that would provide alternate employment. Until this is discovered all superintendents may console themselves with the fact that, had Ed Smiley seen a chance of another job that suited him better, George Carey and his firm would have received very little consideration. —F. P. TERRY.

Which Type of Equipment?

It is hardly possible to place too much importance on care and discrimination in the selection of equipment, not only from the standpoint of initial cost but also from the standpoint of cost of manufacture. The first step to be taken is the analysis of the product to be manufactured, bearing in mind the quantities and the stage of development. If, as in this case, the article is a new type which has just been designed and whose future is still problematical, it is not well to equip a factory too heavily with specialized machine tools. It is quite possible that the article will not find the demand that was expected. Under such circumstances, it is desirable to employ standard machinery which can be turned to other uses.

It is advisable to employ men rather than new or special machines for work of this sort. A machine with careful handling is ready to run twenty-four hours per day. Therfore, it is fundamentally sound to double- or triple-shift each standard machine, rather than buy a special one. —J. M. LIVINGSTON, *Scotland*.

Training Men for Different Jobs

While there are many men who do not take kindly to changing from one job to another, there are always a few who prefer an occasional change to break the monotony. There is also an occasional one who is always ready for a change, apparently for no other reason than just for a change. However, the most of those who prefer to get away from strictly repetition work are more thoughtful of their future, are ambitious and studious, and are the material for making the best of mechanics and executives. I believe it is to the interest of any concern to give such the opportunity to become familiar with more than one job.

As to whether a man should be instructed in two, or more than two jobs, depends entirely on the man and on shop conditions. As a rule there are too few who are desirous of learning more than one job to keep the average shop in a satisfactory condition to meet the emergencies that are bound to occur from absence of other men. I do not think that it is advisable to force men who are unwilling to do so to other jobs, but I believe that it is a movement to be encouraged. —JOHN MARK MAY.

Inspection Methods and Their Application

By Fred H. Colvin
Editor American Machinist

Methods of inspecting cylinder blocks vary considerably in different plants—Relying on fixtures for accuracy vs. checking between operations

INSPECTION practice varies rather widely even in plants in the same locality. Some plants depend largely on the accuracy of the fixtures to keep the work in alignment and to size, while others inspect the work between most of the operations. A good example of the latter practice is found in the Hupp plant, the headpiece and Fig. 20 showing how the height and length of the cylinder block is checked after milling, using special, snap limit gages. Then, before the block goes for boring and other operations, the contour gage in Fig. 21 is used to show whether or not the block will clean-up in future operations. Another and similar gage, illustrated in Fig. 22, is used for checking the cylinder bores and valve seat openings.

Cylinder bores are checked for diameter, roundness, and taper by a Federal 3-point gage of the dial type, the limits being 3.249 and 3.251, a tolerance of 0.002 in. The tolerance for taper and out-of-roundness is 0.005 in. Standard bronze-backed bearings are used, and as they are bored after being put in place, it is essential that the bearing seats be in line and of the correct radius to receive the bearing shells. The radius is tested by the special indicator gage in Fig. 23. This gage has a base that is a duplicate of the bearing caps and is fastened in their places, successively. The indicating point is then rotated in the fixture and the diameter is read on the dial gage. Another bearing gage, Fig 24, is used to check the bearing seats in relation to the face of the cylinder block. The gage rests on the end bearing and the one next to it, and is set from one of the locating holes by the knurled plug shown, while the hardened stud *A*, resting on the lower face of the block checks the correctness of the relation.

When building the Chrysler 65, the crankcase face is tested after milling by the plate gage in Fig. 25. It is set by two plugs from locating holes that will be used later, and the plate shows whether or not the block is O. K. for future operations. In this motor an interchangeable type of bearing is used, and Fig. 26 shows the test bar for testing the alignment of the bearing seats. The bar is of such diameter that it can be turned by hand if the bearings are of correct diameter and in alignment.

After the cylinder block has been completed, each bore is carefully measured and the size is noted on a tag printed for the purpose. Each block is numbered, and the tag, bearing the number and the size of each bore, precedes the block to the assembly department. This enables the proper piston for each bore to be selected and marked by the time the block arrives. This method has proved a time-saver, and prevents delaying piston selec-

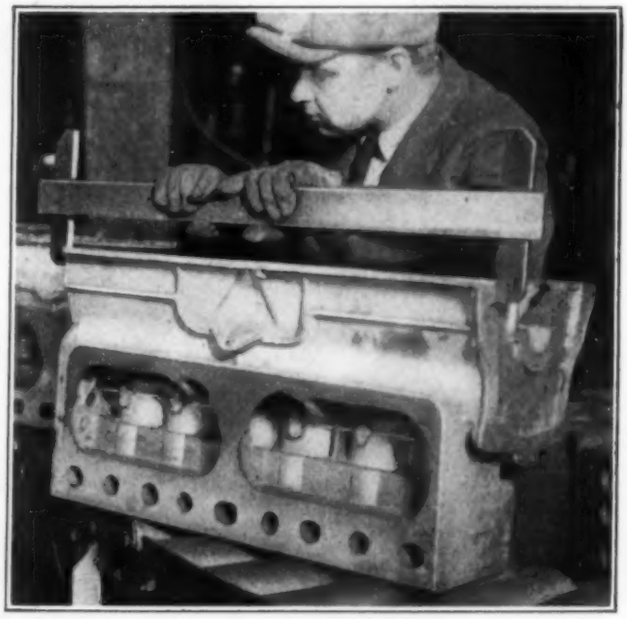


Fig. 20—A gage used in inspecting the length of the cylinder block. Both the length and the height of the block are held within close limits. This gage is built-up, the crosspieces being riveted or held by screws

The third article of a series. The fourth will appear in an early issue.

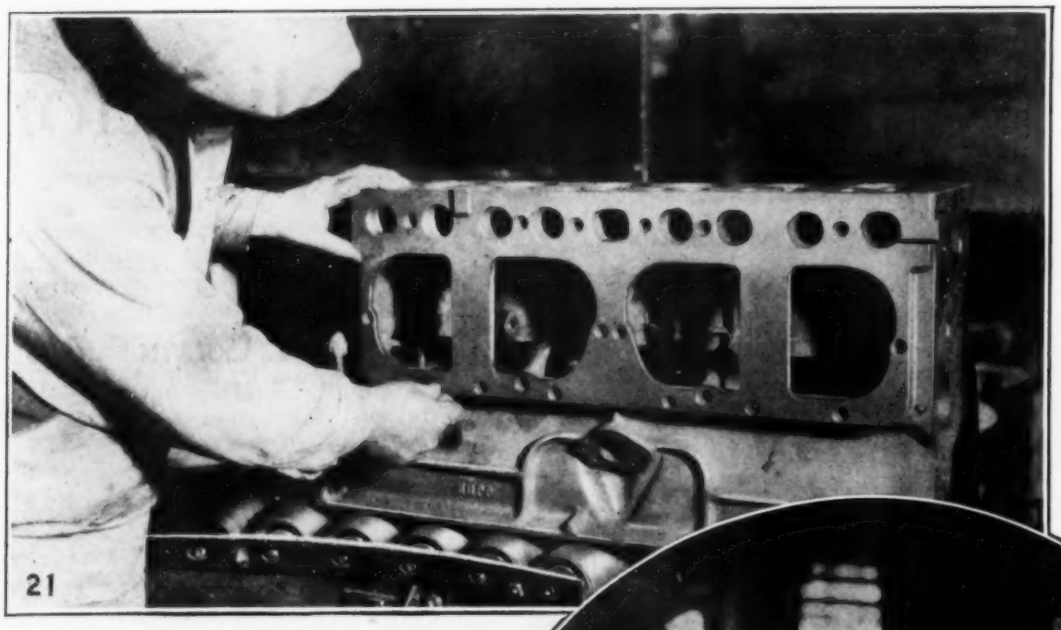


Fig. 21—Contour gage for the side of the cylinder block. This gage shows whether or not all the manifold openings and various bosses will clean up. In the hands of an experienced inspector this type of gage gives the information desired, almost at a single glance

Fig. 22—A contour gage for the top of the cylinder block. By it the locations of the cylinder bores, valve openings, and stud holes are checked. Here again, the inspector with a trained eye can note every necessary outline in much less time than seems possible

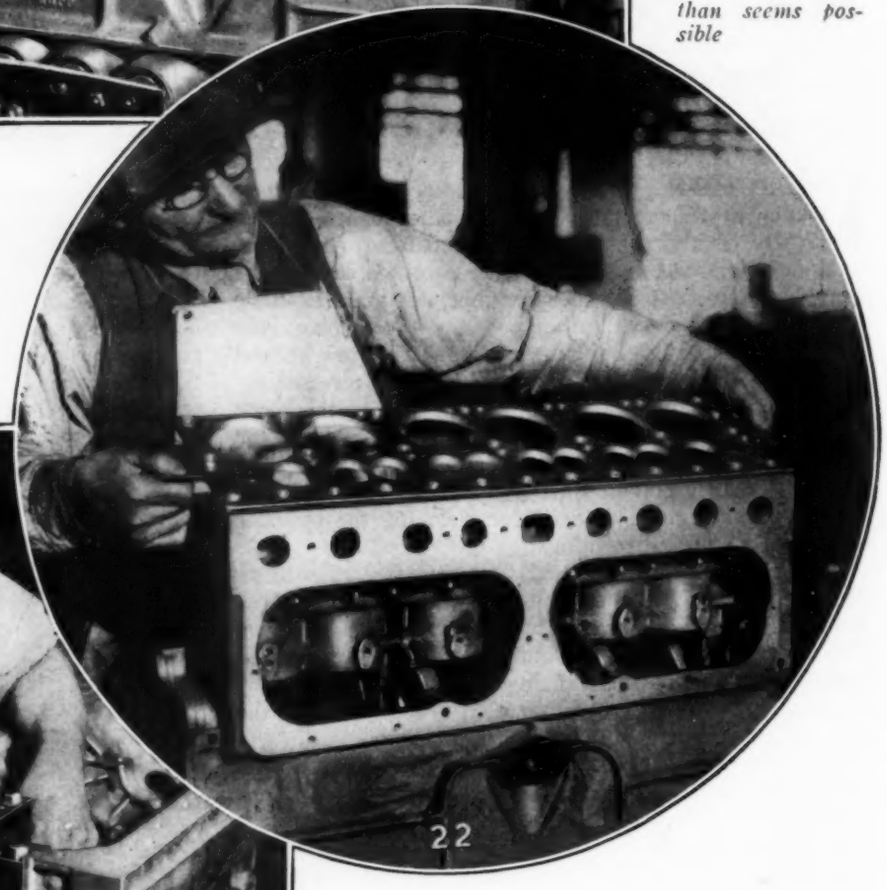


Fig. 23—Gaging the radius of the main bearing seats. The body of the gage is attached in place of one of the bearing caps, and a finger in contact with the bore indicates the radius on the dial gage. Although seeming to be a slow gaging operation, it is performed much more rapidly than might be expected

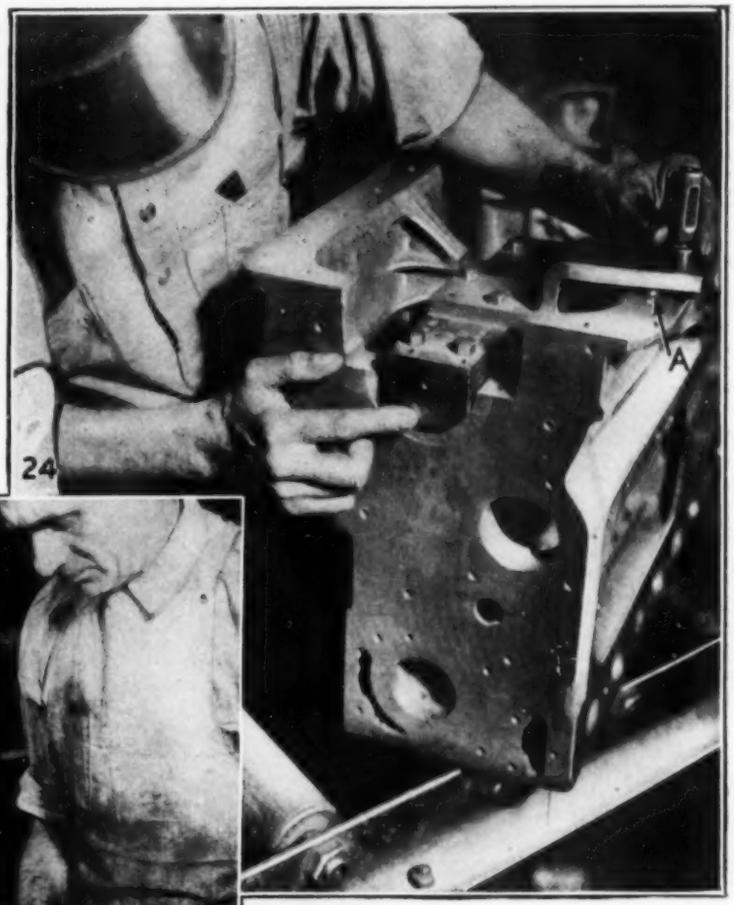


Fig. 24—Checking the bearing seat in relation to the surface of the crankcase joint. The gage spans two bearings and is positioned by the plug in one of the locating holes. A hardened pin resting on the joint surface, checks the correctness of the relation. This gage and method have proved very useful in checking this important point

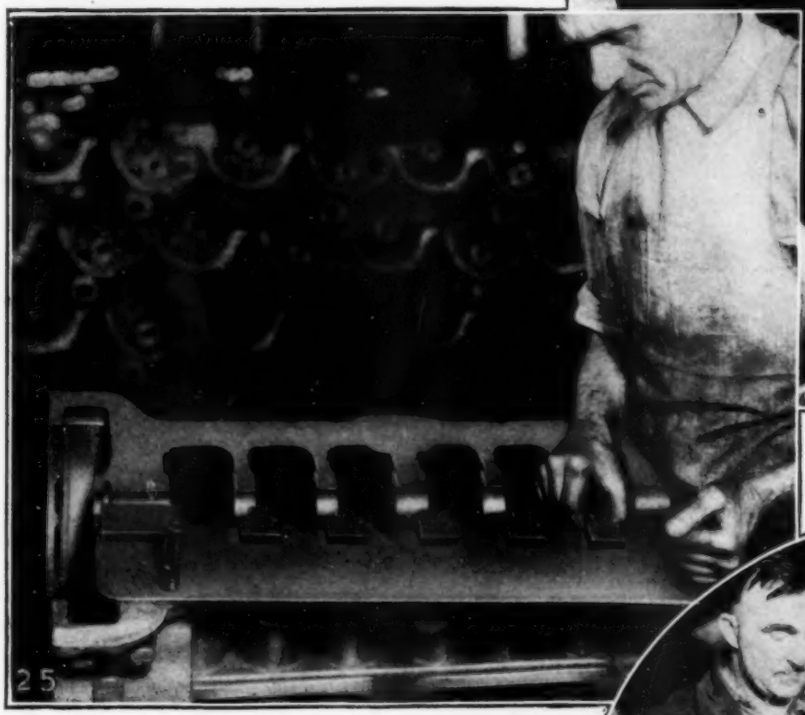


Fig. 25—Plate for checking the location of bearing in crankcase. The test is made after the face has been milled, and before the case is bored. This is another simple-looking gaging operation that has been found of real value in securing the desired accuracy

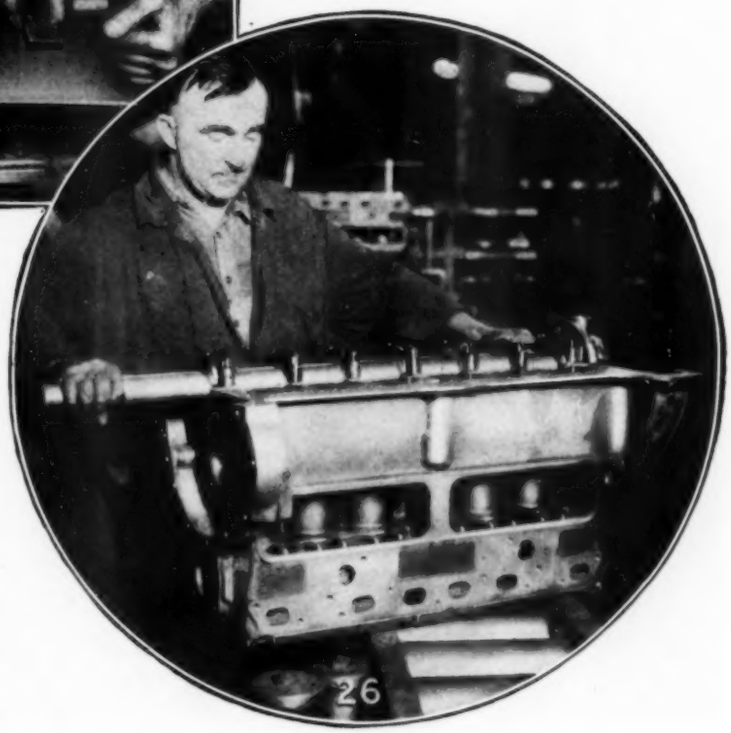


Fig. 26—Testing alignment and fit of seven bearings by a standard test bar. The bearings are interchangeable, and are not bored after being put in place. It is no easy matter to secure accurate alignment of seven bearings, but this inspection insures the alignment and fit desired

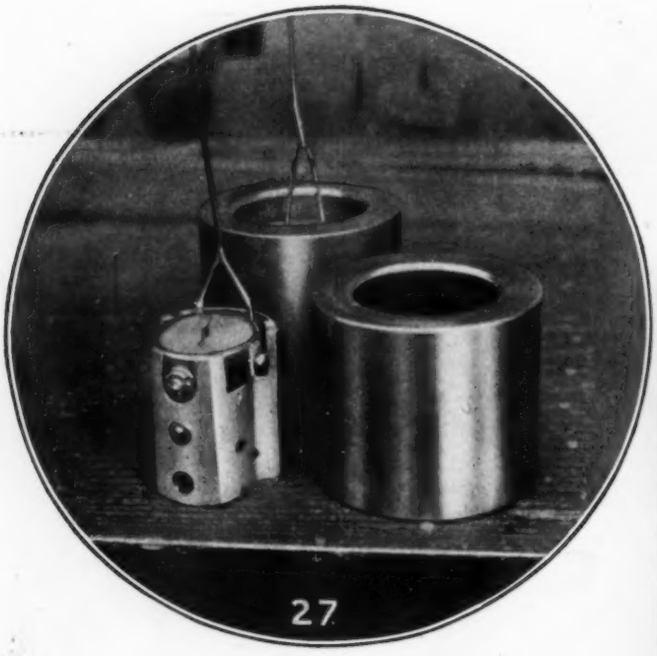
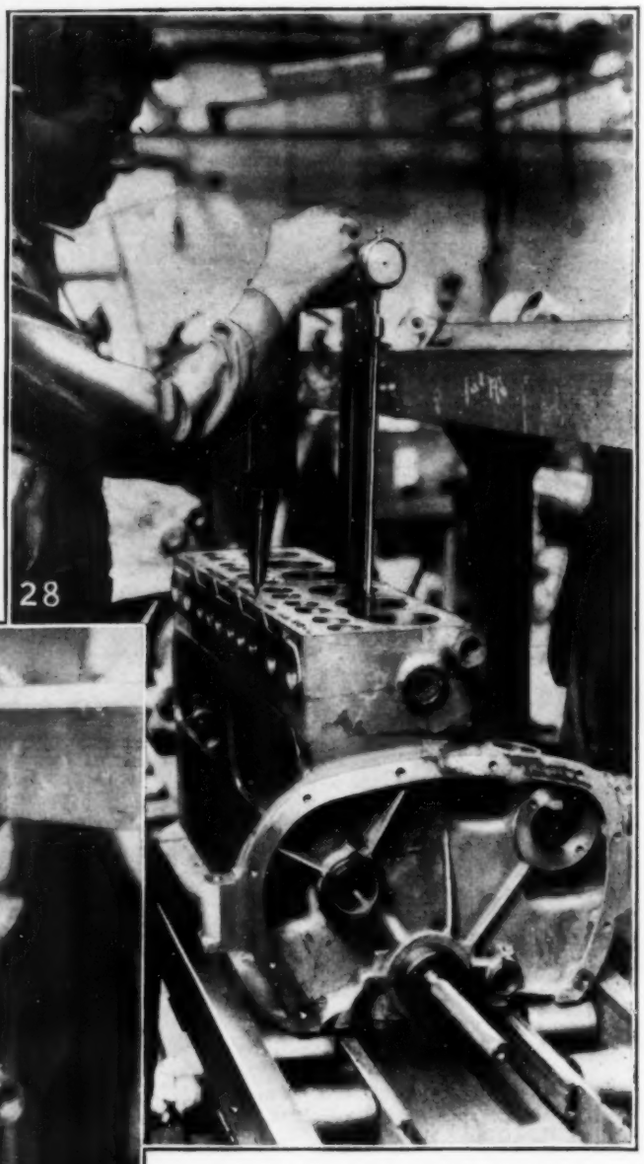


Fig. 27—Special two-point measuring head for inspecting Graham-Paige cylinders. The gage is protected in the piston-like case, and has a convenient bail by which it is handled. When not in use, this gage is kept in the standard sleeve or ring by which the indicator is set before use

Fig. 28 — Gage for checking the squareness of cylinder bores with the crankshaft. The body at the right bears against the wall of the cylinder, while the rod in the center of the tapered arm contacts with a dummy crankshaft, through another cylinder. This shows the substantial construction of the gage fairly well. It has proved very successful in detecting any misalignment of the boring machine spindles



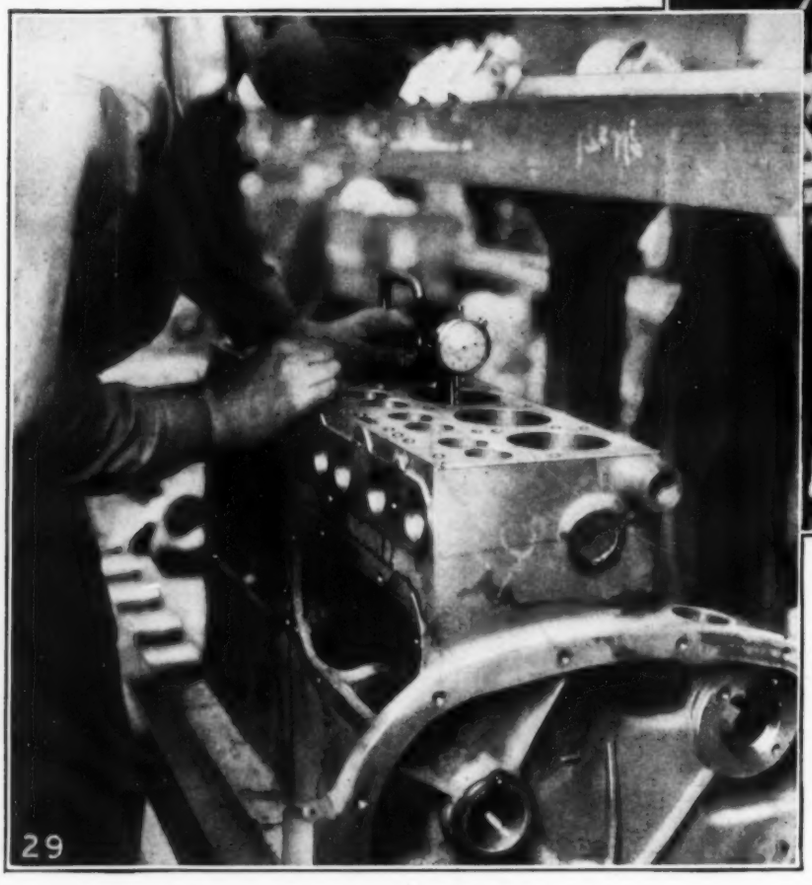
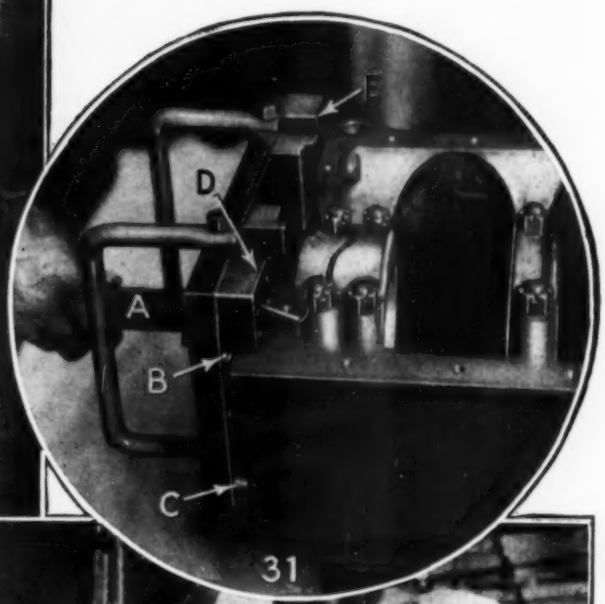


Fig. 29—The "squareness" gage in place in cylinder block. Any deviation from squareness affects engine friction and wear. The dial indicator shows the squareness of each bore. The dial is easily read and the gage is not cumbersome to handle. Every bore can be inspected, reversing the gage for the bore at the other end

Fig. 30 — Water test for cylinder blocks. Lights beneath and a mirror above, enable the operator to see inside of every bore and to detect even a minute seepage of water. This method not only enables the detection of the smallest leak, but speeds up inspection by giving a clear view of the interior of the whole block at once

Fig. 31—A method of checking the relation of the flywheel-housing dowel holes to the crankshaft bore. This gage also tests the distance from the dowel holes and shaft bore to the joint face of the block, by means of flush pin gages at D and E



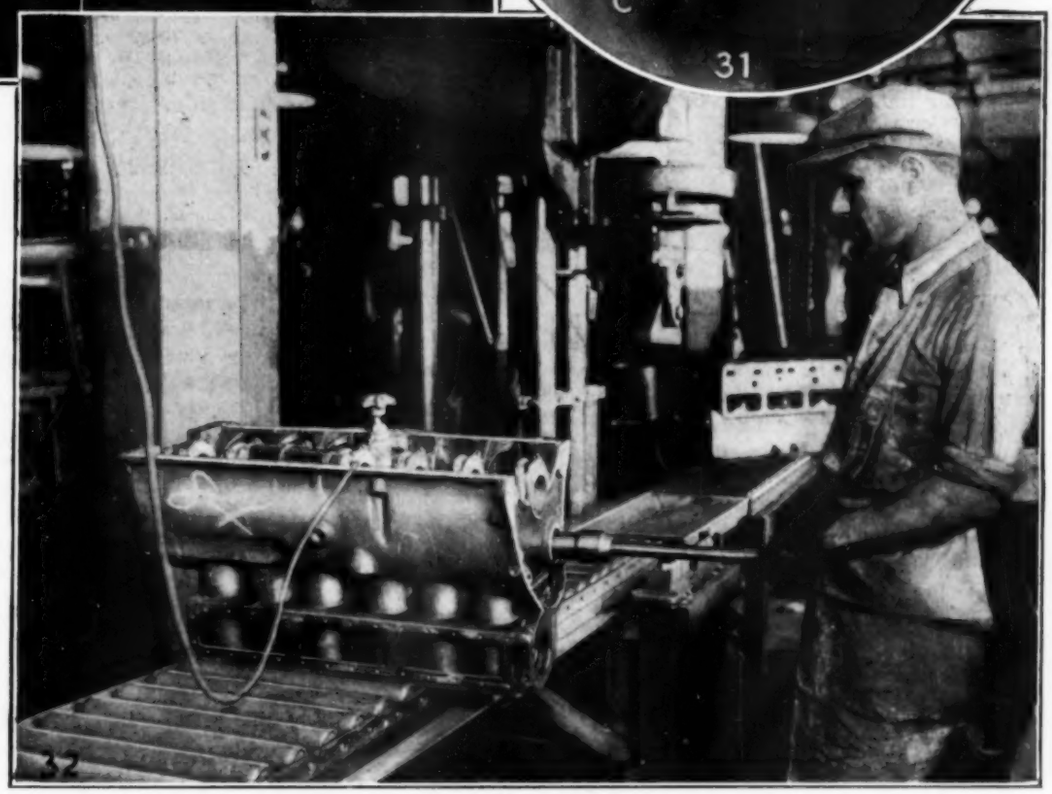


Fig. 32 — Checking the center distance between the oil-pump drive gear and the gear on the camshaft. Collars of the same diameters as the pitch lines of the gears, placed on the test bar and the plug, show whether or not the gears will mesh correctly when assembled

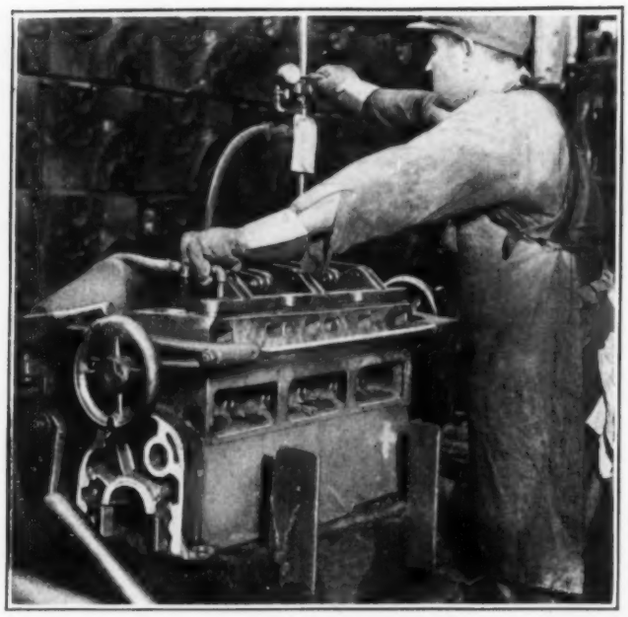


Fig. 33—Continental water-test fixture. This fixture is convenient and substantial. The rod across the front, near the top, helps to locate the block and carries the plugs for each end. The pressure gage is conveniently seen by the operator. The lever at the side controls the front bar while the wheels close the end openings

tion until after the block reaches the place of assembly.

In addition to the regular gages for checking the machining of cylinder blocks, the Graham-Paige plant has a few that are different. The gage for measuring cylinder bores, for example, is the two-point device shown in Fig. 27. It is a standard dial gage fitted in a shell that somewhat resembles a piston. This shell protects the gage and also carries the mechanism of the measuring points, one of which can be seen at the center of the case in which the gage floats. The heavy ring is a standard by which the gage is set before checking the cylinders. The wire bail by which the gage is handled has a convenient loop on the end.

A rather unusual gage is to be seen in Fig. 28, and in use in Fig. 29. It is for testing the squareness of the cylinder bore with the crankshaft, a very important factor in engine friction and long life. The vertical arm at the right in Fig. 28 is held against the wall, of one cylinder as in Fig. 29, while the small rod in the center of the tapered arm, goes through another cylinder and touches a test bar that represents the crankshaft. Any inclination of the bore from 90 deg. is shown by the dial indicator. This method has been found very satisfactory in checking the work for alignment of the boring and reaming spindles of the cylinder boring machines.

Graham-Paige has an unusual method of making the final water test for leaks in the cylinder block. The fixture shown in Fig 30, is a very substantial and well built testing apparatus for applying water pressure to all the water cooling passages. The upper part of the device does not completely cover the top of the block, however, but has openings through which the tester can see the cylinder bores reflected in a mirror set at an angle, above the block. This mirror, in combination with lamps below the block, enables the operator to look into every bore and valve opening and see if any water is seeping through. Since there is no depending on maintaining the pressure, he actually watches for leaks.

Among the special inspection fixtures used in the Continental Motors plant, is the gage in Fig. 31 for checking the relation of the flywheel-housing dowel holes to the crankshaft bore. With the bearing cap in place, the plug *A* is pushed in position in the bearing, the pins *B* and *C* check the dowel holes. Flush pins *D* and *E* also check the distance from the joint face to the dowel holes and the bore.

The proper location of the oil-pump shaft hole with relation to the camshaft is necessary to secure correct meshing of the gears for driving the pump. The location is checked by a bar in the camshaft hole and a plug in the hole for the pump shaft, as in Fig. 32. With collars on the bar and the plug, representing the pitch

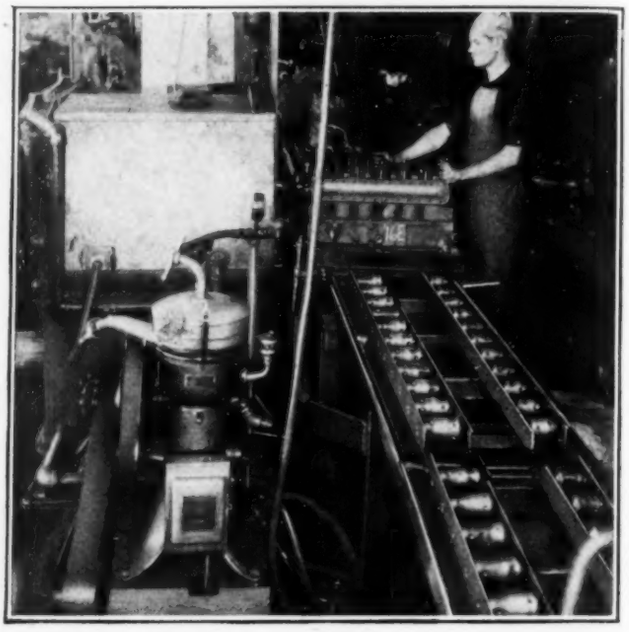


Fig. 34—Washing the oil lines with kerosene under pressure in the metal box shown. All kerosene is cleaned by the small centrifugal machine before it is used again. The cleaning process removes all impurities and foreign matter, and prevents it from lodging in bearings or passages

diameters of the gears, it is easy to tell how the gears will mesh when the motor is assembled.

The water test is shown in Fig. 33, the test block being conveniently arranged for the operator. The cylinder block is held in position by the side arms and cross bar near the top, the handwheels at each end closing the end openings. The three pads closing openings in the top are controlled by the lever at the side, while a small gage beside the water-admission valve enables the operator to read the pressure easily.

After the water-jacket cover plate has been put in place, the block is sent to the washing stand shown in Fig. 34, where kerosene is forced through all the oil passages to be sure that they are perfectly clean. The kerosene from the tank after being used, is piped to the De Laval separator shown in the foreground, and is cleared so that no small chips or other particles can be forced from the tank into the oil passages. The outfit is a very compact one for this purpose.

In too many cases management talks about the need of leadership in foremen and then gives them no opportunity to display initiative if they have it.

How Temperature Affects Fits in Aluminum Alloys

ALUMINUM alloys are being used extensively in internal combustion engines and in other machinery, even in some cases in machine tools. Aluminum-alloy pistons are almost universal and aluminum-alloy connecting rods are to be found in many engines. In all its uses the question of expansion and contraction, as compared with the steel or other metal with which it contacts, is more serious than appears to be realized.

As aluminum expands and contracts approximately three times as much as steel, it is not easy to secure duplicate results at various shop temperatures. Taking the connecting rod as an example, it will be seen that, as the rod contracts three times as fast as the steel gage that measures it, the fit of the rod on the crankpin will depend on the temperature of the shop when the rod was machined and on that of the engine when in service.

Builders of automobile engines have experienced difficulty with the fit of rods on crankpins in extremes of temperature. Where, for example, it is customary to leave a clearance of 0.0015 in. for an oil film under normal temperatures, with the shop at from 65 to 68 deg. F. and both the work and the gages at the same temperature, the size of the connecting rod bearing will be different than if the shop temperature should drop to 45 deg. on a cold morning.

Assuming that a uniform shop temperature is maintained, there is still the difference between it and the outdoor temperature when the engine is in service, and there have been cases where connecting rods have stuck, or frozen, due to the contraction of the rod being sufficient to seize the crankpin. To insure against accidents of this kind it is customary, in at least one shop, to allow a little more rod clearance in winter than in summer. An additional clearance of 0.0004 in. is allowed for new engines that go into service in the winter months. Engines built in the summer are considered to wear sufficiently before winter to give enough clearance even with the maximum contraction.

The use of a reinforcing steel cap over an aluminum alloy cap so reduces the amount of aluminum alloy necessary as to noticeably affect the expansion and contraction. For this reason some engine builders use a steel cap, or strap, on the outside of the aluminum alloy cap in order to get the required strength with a smaller amount of alloy.

Steel Versus Alloy Caps

Experimenting along this line, one of the former engineers of the Stutz Motor Car Company had eight sets of connecting rods made with all alloy caps and an equal number with steel reinforcements or straps. These rods were given clearances varying from 0.0012 to 0.00315 in. for the all-alloy rods and from 0.0006 to 0.0023 in. for the rods with the steel reinforced caps.

The rods were fitted and measured at a shop temperature of from 65 to 68 deg. F. and were then brought down to 28 deg. F., a drop of 40 deg. At this temperature all of the all-alloy rods turned freely by their own weight. They were then put in a refrigerator and brought down to 8 deg. below zero F. Even with this drop of 60 deg. all the all-alloy rods would turn except the one with the 0.0012-in. clearance. This took considerable pressure to break it loose from the shaft. Under the same conditions, all the rods with the steel caps turned except the one with the 0.0006-in. clearance. This rod, however, broke loose more easily than the tight rod with the alloy cap.

These tests indicate that an alloy rod with a steel supported cap will not seize at 8 deg. F. below zero, if there is a clearance of 0.00145 in. measured at normal shop temperature of 68 deg. Fahrenheit.

The Hupp eight-cylinder motor was formerly equipped with duralumin connecting rods and, with the steel caps, they were found very satisfactory. The introduction of higher compression, however, made it advisable to have less clearance between the rods and the crankpins to avoid noise, and even with the steel caps, the expansion and contraction was sufficient to cause trouble in extreme cold weather.

This trouble, however, has not developed in the Franklin engine, although there may be a difference in the compression between it and the Hupp. In the Franklin engine, selective assembly is practiced, so as to give 0.0015 in. clearance between rods and pins, which is found to be satisfactory for both winter and summer production. The Franklin engineers feel the duralumin connecting rods will grow in favor as the behavior of that alloy becomes better known.

In assembling piston pins, it is customary in many shops to heat the aluminum pistons before pushing the pins into place. The pins are gripped when the pistons cool and do not become loose when the pistons heat up in service.

Substitution of Steel Castings for Cast Iron in Machine Tool Construction

Discussion

By R. E. Flanders
Manager Jones & Lamson Machine Company

SO FAR as we are concerned it is only in the exceptional case that we are interested in the strength of a casting in any main member of a machine tool. The limiting factor is not strength, but rigidity. The member must not deflect more than a given amount under a given pressure. In all ordinary cases where the requirement of rigidity is met, strength is amply taken care of, and the unit stresses involved in the material are surely far below what even a poor grade of cast iron will provide, if it is a good clean casting of good structure. This factor of the situation is not taken into account by people who wish to replace cast iron with welded steel.

It is also true, of course, that mere mass is desirable in some places, under some conditions, for absorbing vibrations. This also points toward the satisfactory use of a low price material.

I am also a little skeptical about the use of steel for slides. Soft steel is a notoriously bad material for roughing up under the slightest failure of lubrication. Cast iron, on the other hand, will stand an immense amount of abuse after it has once received a good surface before it will rough up.

In his examples of places where steel castings are needed I would not include lathe carriages or tail stocks where rigidity is more important than strength. Face plates and some of the larger gears are more normal uses for steel castings.

· THE · FOREMAN'S · ROUND · TABLE ·

The following narrative is a "case" presentation of the topic. It has been written to involve some of the questions that arise in the average shop. For guidance in preparing discussion the questions at the foot of the page have been prepared

Should the Men Support Their Own Club?

ED HAD been away on a vacation to a middle-west city where he found a large company had provided a fine club house for the men. He was enthusing over it to Al.

"That's some company to work for, Al. You never saw such a club house. Shower, swimming pool, gymnasium, and an auditorium where they dance and have movies and concerts and all the rest. And it doesn't cost the men a cent."

"And you're the bird who was kicking a while ago about firms spending money for flower gardens instead of putting it in the pay envelope."

"But they don't take it out of the men. They pay it all."

"Ed, my boy, two and two still makes four. From what you say, that club house costs a wad of money. Divided up among the men it would make a nice start toward the first installment on a new car.

"I'm not arguing against the club house. I think it's a good thing. And I know the old man wants to build one for us. But it won't be free if he has his way about it."

"Wants to make us pay for it, eh?"

"Only part of it, Ed. He wants the company to build the club house, with a committee of the men to help decide what to get. Then he wants the men to pay nominal dues and run the club."

"If other firms can afford to pay for the whole thing, Al, I don't see—"

"But that isn't the question. If it's a club for the men they ought to run it and help pay for it. You always appreciate a thing more if you chip in on the expense."

"But won't the company want to run the club? Suppose the committee wanted to have a talk on unions or prohibition. Would the company stand for it?"

"I think so, Ed. The company will insist on good care being taken of the buildings, and order being kept. If there are enough men interested in general questions to have them discussed, it's a lot better to have it done openly and by men who know something about the subjects, than for a few to sneak off and get all 'het up' from hearing some half truths.

"That's why the old man wants the men to pay dues—so they'll feel it is their club and not just a place where they can go when the bosses invite them."

"I'm not so sure that it makes much difference, Al. The men in this club I saw seemed to like it that way."

Do you agree with Al that the men should pay dues and run the club themselves? Or with Ed, that it is just as well to have the firm pay all expenses? Which way will the men take more interest?

All foremen are urged to discuss these questions vital to their work; of course the

discussion is not limited to foremen. Letters accepted and published will be paid for

Discussion of Earlier Topics

Wear Goggles or Quit

APPLIANCES or auxiliary devices that make for the safety of the operator of a machine ought to be considered as a part of the machine. No man should be expected to provide such devices. The firm should provide them and make their application or use convenient. Goggles in connection with certain operations are in a class with guards about machines. Failure to use them, when their use is convenient, is like removing a guard before operating a machine. After a few warnings, punishment for violation of the safety rule ought to be severe. Discharge may be quite justifiable.

—E. SIMONSEN.

EVERY worker should wear goggles when grinding. However, firing a man because he fails to wear them is not a good way of impressing the rest of the workmen. Such a step will not make them co-operate nor show them the justice in co-operation for safety control. It will only make them bitter toward the company.

A better plan would be to bring the subject of safety goggles to the attention of all the workers, and point out to them the necessity for wearing such safety appliances. Loyal and obedient workers who follow instructions wholeheartedly and explicitly, and recognize the mutuality of interests, will not have to be told twice the necessity of using this safety device. However, should a man persist in not wearing them and so endanger his life, he should be warned. If the warning does not produce results, he should be penalized by suspension for a day or two to impress it more forcibly on his mind. When he returns, a short talk by the foreman will do more to make him see his error than firing him.

—S. KUPPER.

FIRING a man because he does not wear goggles when grinding is too drastic a measure to insure the co-operation of the rest of the workmen. The company should first investigate why the workers are not wearing the available goggles. Argument will not persuade a workman to wear uncomfortable goggles. Workmen will wear them because they are comfortable, because they are adjustable to the face, and fit snugly and rest easily over the eyes, as well as for the fact that they protect the eyes. A man wearing comfortable goggles is not "goggle conscious."

The National Safety Code for the protection of head and eyes contains high standards of construction, comfort, and protection which no manufacturer can afford to disregard. I would suggest that the goggles now in use be tested for comfort before any drastic steps are taken by discharging an employee for not wearing them. Should a few workers then persist in not wearing them, these employees should be penalized by the deduction of several hours' pay, and made to understand that the company is interested in keeping the worker safe.

THE·NEXT·TOPIC

Handling the Shop Office

ADVANCE QUESTION

Ed is having difficulty in relieving himself of routine without losing control. Al thinks he should follow the main office procedure. How do you do it?

Standards for Machine Finishes

TO CONVEY a mechanical idea by words is often difficult. A drawing gets it across better, but a model puts it over best of all. So it is with machine finishes. The judgment of individuals varies with their types and source of training, as well as with their individual preference. A set of standards, fixed in actual specimens of machine finishes and keyed in with the finish marks used on the drawings, alone remains fixed. Such a service standard will unify the finish and the product, save argument as to what finish should be used, and put the right finish in the right place.

—B. E. LAMBERT.

OPINIONS vary concerning the types of finish called for on drawings. What would be a smooth finish for one man would be rough to another. Therefore, if sample pieces of metal with required types of finish were furnished, the mechanics could compare their work with these. These pieces of metal should be kept in a place easily accessible to the men and preferably mounted on a board in the shop. If placed in the shop, the men would be more likely to make use of them, as a man dressed in overalls generally dislikes to enter the office unless it is absolutely necessary.

—C. H. PEARSON.

THE selection of the proper machine finish is a most important consideration if costs are to be kept down and a satisfactory product turned out. This selection should be made by the designer and production engineer as these two are best qualified to judge what is desirable and necessary. The selection should never be made by the workman. In the first place, he is not aware of all

the factors, such as cost of production and final appearance of the finished product, which enter into consideration. Furthermore, training and temperament enter largely into his decision.

A set of reference standards, readily available to all concerned, should be very valuable. The writer has been able to materially speed up the production of a small precision instrument part by careful consideration of this matter of finish. It had been formerly left to the judgment of the workman who, being trained in the old school, gave a great deal of attention to draw filing, polishing, and lacquering. It was found that the greater part of this was unnecessary, and if anything, detracted from, rather than enhanced, the appearance of the finished instrument. By eliminating the greater part of this work, the appearance was improved and costs reduced.

—D. L. PARKHURST, *Chief, Instrument Division, U. S. Coast & Geodetic Survey.*

Helping the Firm Make Sales

IT IS considered good policy to reward workers for worthwhile suggestions which aid production. Is it less beneficial to the company when its workers aid sales? The former is awarded in addition to the ordinary pay. Why not make a bonus award in the latter case also?

If an outsider should secure a good order he would be almost certain of his commission. The insider who can do likewise should be recognized.

—W. MARDY, *England.*

THE fact that Roberts has done a good stroke of business for his firm is not everything. He has also had a delightful experience in salesmanship that may lead him to an important position, either in his present firm or elsewhere. The firm's position must also be considered. It may put Roberts' success down to a lucky hit that may lead him to waste many hours hunting sales that do not come off, and for which he will expect his usual salary. In the meantime, Roberts should carry on without wasting time on the side. Any more prospects or sales should be passed on to the regular salesman who will, no doubt, recompense him. The writer followed this method with satisfaction to the salesman concerned, the firm who were aware of it, and to himself. —F. P. TERRY, *Ireland.*

Helping the Efficiency Engineer

THE foreman who isn't open minded enough to cooperate with his employer when he has decided that something is wrong, is past his stage of value and should step out. When we go to a physician for advice, do we stand idly by with a cynical smile while he tries to get to the bottom of our trouble? Is there any more reason why we should fail to expedite matters with the industrial physician? Of course, if the employer does not obtain a highly recommended engineer, one cannot blame the foreman for holding back. —J. HOMEWOOD.

NEITHER Al nor Ed seem to know why the efficiency engineer is being hired. Executives do not employ efficiency engineers unless there is some specific problem they wish to have solved. Perhaps there is a need for increased production, lower cost of production, or a different method of estimating costs. Perhaps a competitor is employing a more efficient method of doing the same class of work, and it is desired to establish a similar method. The busy executive does not have time to go into all the details involved, and so the efficiency engineer is employed to get all the material in concrete form and to present it with recommendations.

It is possible that information from Al and Ed will not be required. However, if they do all they can to assist, and the efficiency scheme does not work out as well as expected, the blame certainly cannot be placed on them. —S. C. MARTIN.

Should He Report Another's Error?

WHEN foremen begin reporting one another—good-by to co-operation between departments. The foreman who found the motor should take up the matter with the foreman who lost it. This foreman having been informed of the discovery, should be left to do what he thinks fit with both motor and culprit.

The first step on the part of the workman was probably due to curiosity, a valuable trait when under proper control. The second step was due to fear of the consequences of confessing to his foreman what he had done. What shall be done? Have him up on the carpet, and if he is a good worker, let him off with a caution. The company loses little by the motor being transferred from one department to another, but it gains a great deal by having everything straight and above board. Heaven only knows where suspicion would stop once it is discovered that one foreman has lost a machine and another has found it, and that both have been hiding the fact from the management by making false returns.

— H. W. JAMES, *England.*

Vacations as a Bonus

AL'S IDEA of offering a week's vacation with pay each year is a very practical one, but does not cover enough territory. Probably all the men in the shop feel like Ed and Al do, and a week's vacation will pep them up also. Why give the medicine to only a few and suffer decreased efficiency and production from the other employees? The average shop can pay dividends on the investment of one week's vacation with pay to every employee who has worked at the same job for one year steadily. A change will break the monotony and give the employee a fresh grip on himself and his work.

A week's vacation each year should be compulsory. Years of experience with employees performing work which becomes monotonous has convinced me that a week's vacation at the end of each year of service is practical and profitable. —T. HOMER THOMAS.

Paying More to Save Money

IT IS the function of the designing department to specify the materials to be used in any detail, so that any questions regarding the possible substitution of one material for another should be referred to this department for approval. It remains for the drafting department to check the feasibility of a change in material, and if found practical to convince the customer that the change in material is to his advantage. —J. KOLLARIK.

Wabash Shops Are Enlarged to Meet Repair Demands

By Frank W. Curtis
Western Editor, American Machinist

Changing locomotive repair shop from longitudinal to transverse type by constructing new unit across original building near the east end

COMPLETION in 1913 of the Decatur, Ill., shops of the Wabash Railway Company, made possible the handling of major repairs at a central point rather than at a number of outlying localities, thus to a great extent fulfilling a long-felt need of the system. However, steady increases in the size and quantity of locomotives since that time, soon exceeded the capacity of the shops for repairs, again necessitating the use of outside repair points to meet the demands. This condition created the need for a larger shop—one with ample facilities to meet even further anticipated increases in motive power, so that the original policy of having a central repair point conld be carried out.

After considering different means of expansion, the decision was reached to construct a new locomotive shop, squarely across the old building. The construction was completed two years ago, so that the present layout embodies many features that aid the efficient handling of repairs. A relatively small section of the old shop had to be removed to make way for the new structure, although a complete re-arrangement of machinery was required.

A general view of the present arrangement is illustrated in Fig. 1, showing the position of the new structure in relation to the original building. The older shop is 1,125x180 ft., while the newer unit is 675x148 ft. As formerly arranged, repairs were handled by moving locomotives on three longitudinal tracks, located along the north side of the old shop. The present arrangement has converted the shop from a longitudinal to a transverse type, as shown in the layout in Fig. 2. At the west bay of the new building, the width of which is 84 ft., are located 29 pits, while the remaining portion of the structure houses the light machinery bay. A sectional view of the construction is shown at the lower left.

One of the outstanding features of the present locomotive shop is that ample room is provided for the convenient handling of repairs. In no department is the machinery congested to such an extent that working facilities are cramped. This feature is one of economic importance in connection with the handling of such work, and at the same time, it has reduced accident hazards materially, thus placing the shop in a commendable position from a standpoint of safety.

Material-handling problems are well solved by overhead cranes. In the new building the erecting bay is served by one 200-ton gap crane and two 15-ton cranes, while the light machinery bay is served by two 10-ton cranes. The gap crane is arranged so that the largest locomotive can be lifted over the smaller cranes and not interfere with their operation. The east end of the old building, housing the heavy machinery, is served by one 75-ton and two 10-ton cranes, and the west end has one 75-ton, one 20-ton, and one 15-ton crane. With this equipment movement of materials is seldom retarded.

Locomotives entering the shop for repair are placed over any one of the three stripping pits at the south end of the new building. Engines after being stripped are unwheeled at one of these pits and then are transferred to one of the other available pits for repair, the wheel and axle assemblies being taken to the wheel

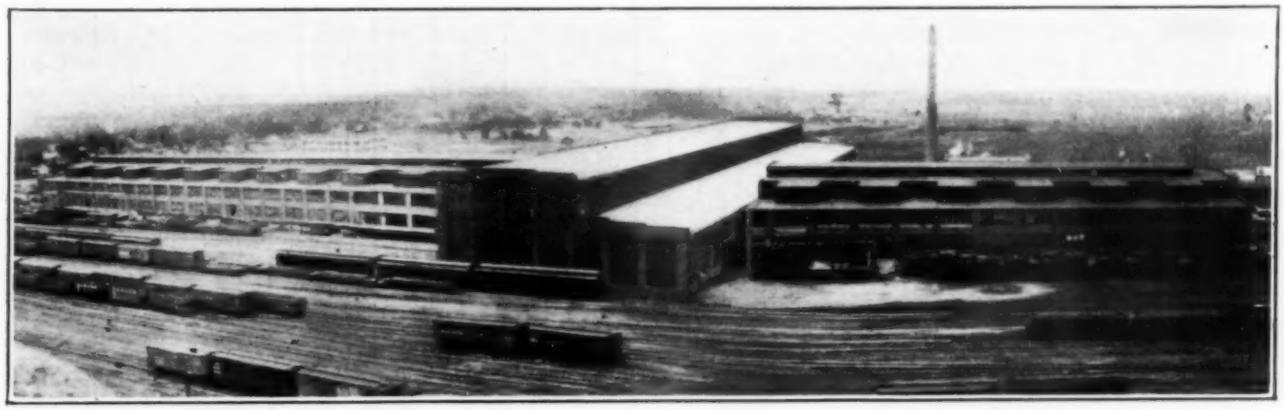


Fig. 1—The construction of a new addition to the Wabash locomotive shops has changed the method of handling locomotives to be repaired. It was necessary only to remove a comparatively small portion of the old building in adding the new structure, although a complete re-arrangement of machinery was required

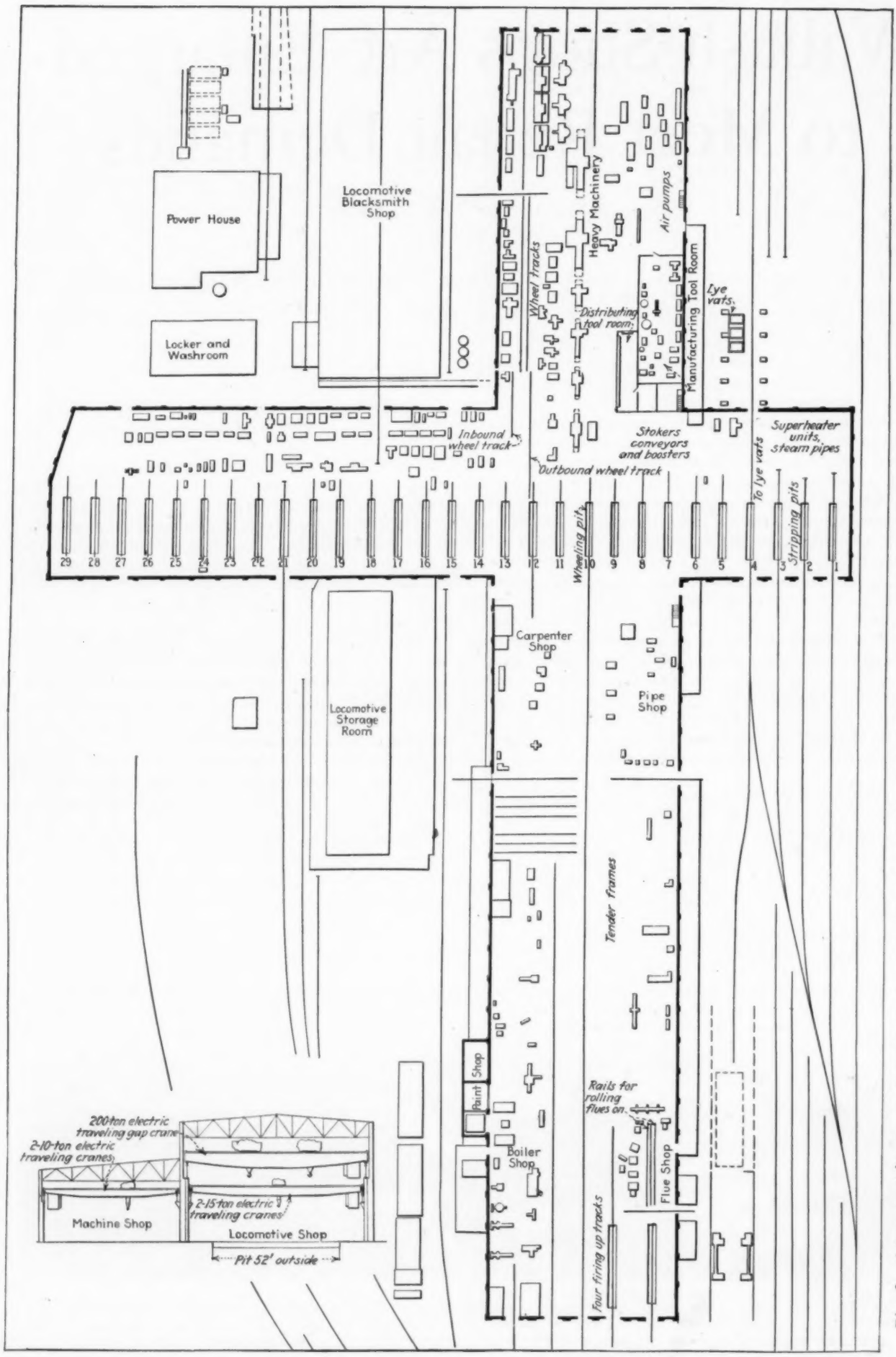


Fig. 2—A layout of the locomotive shop bay, and the older building which contains the heavy machinery and various smaller departments. Stripping is done on three pits at the south end of the shop, on track 10, and then locomotives continue through the west end of the old building, where the assembly is completed

department. All stripped parts are cleaned in a lye vat, located just outside of the southeast intersection of the new and old buildings, and which is connected to pit No. 4 by a through track. After being cleaned, the parts are distributed to their respective departments.

Repaired engines are wheeled on track No. 10, which runs longitudinally through the center of the old shop. Outbound and inbound tracks aid in moving wheel assemblies to and from the erecting shop and the wheel department. All wheeling is done by a night shift, composed of a small crew of men. Likewise, all the transferring of engines is handled at night.

After an engine has been wheeled, it is sent down a track through the west end of the old erecting shop for final assembly. On this track is handled such work as piping, sheet-metal fittings, cab work, and the assembly of smaller operating units, so that when a locomotive reaches the end of the building, it is ready to be fired. Four firing-up tracks are available, in order that no delays will occur.

To place the shop on a high operating basis when the new addition was completed, required the installation of miscellaneous equipment. Individual motor drives are used throughout for all machinery, thus eliminating overhead shafting and increasing the lighting efficiency. A working force of approximately 783 men, operating in 8-hour shifts can turn out 40 class 1, 2 and 3 repairs in a month of 26 working days. This output is an average of one engine in less than 5½ hours, and is largely due to adequate facilities that permit repairs to be made according to a prearranged schedule.

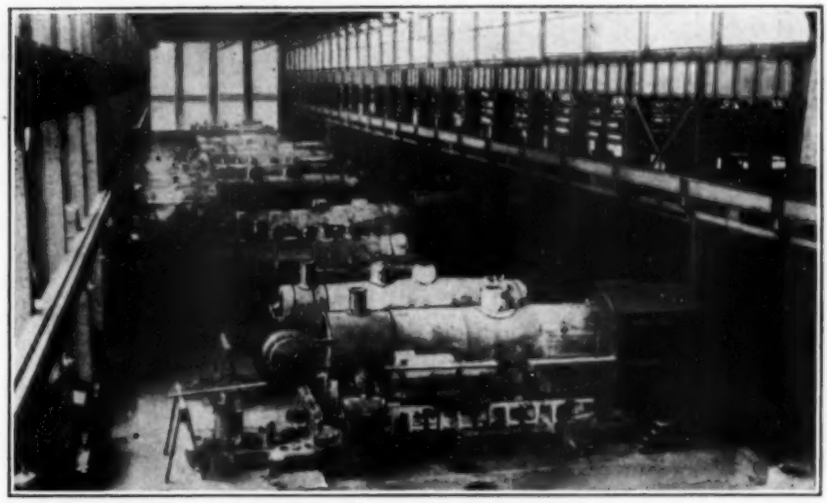


Fig. 3—In the erecting shop there are 29 pits, 52 ft. in length. The pit tracks are 70 ft. in length and can accommodate the largest size locomotive in use. Each pit has steam, water, air, and electric connections at convenient locations to facilitate the handling of repairs

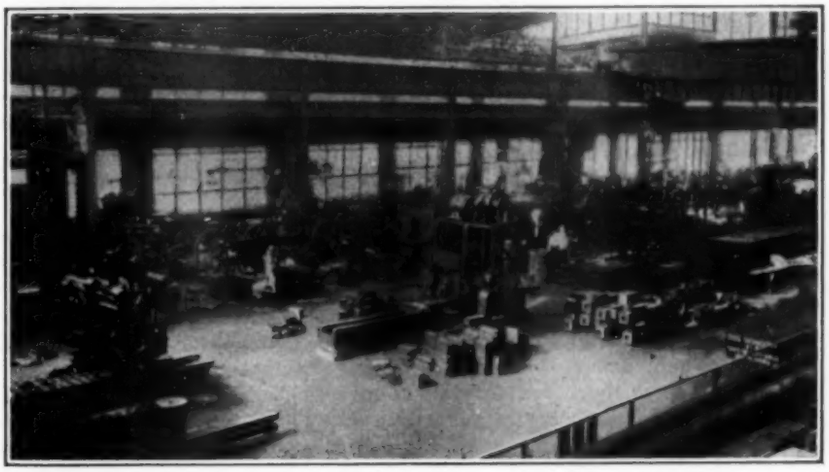


Fig. 4—A view of the heavy machinery bay in a portion of the old building formerly housing three longitudinal erecting tracks. The wheel and axle department is located at the far side of the building, being connected with the present erecting shop by incoming and outbound tracks

A view of the erecting department of the new locomotive shop is shown in Fig. 3. Each pit is fitted with steam, water, air and electrical connections at convenient points. The pits are 52 ft. in length and 3 ft. in depth, while the pit tracks are approximately 70 ft. in length, thus providing ample room for large sized locomotives. The heavy machinery bay, located at the east end of the old shop, is shown in Fig. 4. This bay also houses the toolroom and the air-pump department, while on the balcony at the south side is the brass shop, the shop offices, and the apprentice school.

The Purchasing Agent as a Co-ordinator

AS A four-minute egg the purchasing agent is well known to salesmen, and to those who read all that has been written of his faults. But he has constructive functions as well as destructive or defensive ones, otherwise he would not have much of a job. What one purchasing agent is doing to co-ordinate his own work with that of the engineering and production departments is the subject of the leading article next week. In coming issues there will be more on the subject.

Purifying Oils
by Use of the Centrifuge

By H. L. Kauffman
Petroleum Consultant

It is a mistaken idea that lubricating oils wear out easily in use, and if properly purified a good oil can be employed over and over again

SUCCESSFUL lubrication depends first upon the quality or suitability of the lubricant being used; secondly, upon the manner in which the lubricant is applied; and thirdly, upon the precautions taken to prevent the contamination of the oil before it is applied, and to keep or to make the oil clean if it is to be used over and over again with any degree of satisfaction.

The greatest care may be exercised in selecting the correct grade of oil especially suited to the operating conditions; the oil may be applied in a correct manner to the right place, and in the proper quantity; but unless the lubricating system includes a means of purifying this oil continuously, detrimental results are almost sure to follow.

At one time it was believed that oil "wore out," that is that the oil after being in constant use broke down and lost its lubricating qualities. But now the facts have been established that good oil becomes unfit for use, more often because dirt, water, metal particles, other foreign matter and air get into it. These foreign substances, which are the enemies of lubrication, contaminate the oil and make it unfit for utilization in oil-circulating systems. By agitation of the oil with these substances, a muck-like sludge is formed, and the tendency of the oil to oxidize and to form acids is increased. The presence of these substances in an oil lessens the value as a lubricant. In addition, such foreign matter oftens clogs oil-feed lines, prevents the proper functioning of oil-ring bearings, and proves to be the direct cause of rapid depreciation of machinery, expensive replacements, costly shut-downs and wasteful power consumption. Machinery is now being operated at higher speeds and under conditions far more severe than ever before. However, this has only been possible because of a corresponding advancement in the art of lubrication. So, too, clean oil — made clean by suitable purification means —is now recognized as being of utmost importance in obtaining increased production, and more accurate work. At the present time oils are purified either by filtration or centrifugal means, the latter being the more recent development. Properly purified oil, from the standpoint of service, is equal in value to new oil, and as long as the oil can be kept or made entirely clean it can be used over and over again.

Because of the more recent use of the centrifuge as compared with filtration methods as a means for purifying dirty lubricating oils, the present article will be limited to a discussion of the application of centrifugal force to the purification of oils used in milling and machining operations. From the specific examples that will be given, it will be noted that the centrifuge is particularly adapted for use in purifying exceedingly dirty oils that are run to a central cleaning plant, rather than for use in removing impurities from oil employed in an oil-circulating system, where only a small amount of oil is in use. However, before discussing the operating procedures followed when the centrifuge is so used in purifying oils, it may be well to describe some of the essential construction features of a typical centrifuge.

The centrifuges used in the centrifugal purification of oil consist essentially of a cast-iron frame provided with suitable bearings for supporting a vertical spindle, which carries the bowl at the upper end. The weight of the bowl and spindle, together with any thrust due to driving, is taken by two thread wheels on which the lower end of the vertical shaft rests. Surmounting the bowl are the collecting covers. The top one, known as the overflow cover, is provided so that if at any time the product is fed into the machine in greater quantity than the bowl can handle, the surplus will be discharged into the overflow. This keeps the overflow separate and acts as a warning signal that too much oil is being fed to the machine. The second cover receives the purified oil from the bowl and discharges through the second spout. The oil-purifying centrifuge has a third cover and spout for receiving and discharging any water present in the oil. The largest

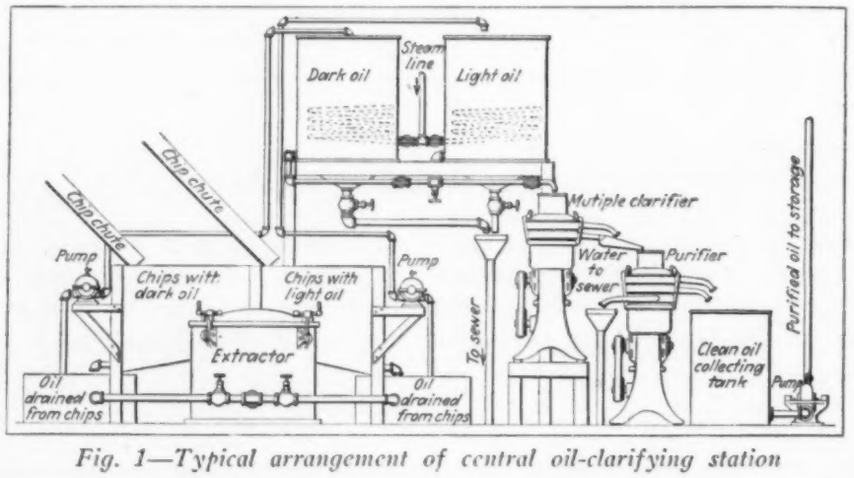


Fig. 1—Typical arrangement of central oil-clarifying station

centrifuge requires less than 2 hp. to drive it. This power can be applied in either of three forms—electric motor, belt, or direct-connected steam turbine. The electric-driven type has a small electric motor mounted on the frame and connected to the driving mechanism by a short belt. The power is transmitted through a worm wheel and worm to the spindle and bowl. The turbine-driven machine is equipped with a steam driving wheel, similar in principle to that utilized in the larger sizes of steam turbines. A steam governor insures a uniform speed, about 6,000 r.p.m., of the machine. Lubrication is taken care of automatically by an oil reservoir at the bottom of the frame. A separate lubricator is provided for the top bearing.

With the exception of the number of receiving covers and discharge spouts, the features so far described are identical in the "clarifying" and "purifying" types of centrifuges. It is in the design of the bowl, which performs the actual work, that the machines are radically different.

Operation of the Machine

In the multiple clarifying type of centrifuge, the oil to be clarified is fed into the top of the bowl and first enters the inner chamber, where the heavier and more easily removed solids are thrown out and held in the sediment pockets. The semi-clarified oil then passes into the second or outer chamber where, by reason of the greater diameter, a maximum centrifugal force clarifies it of the finer and more difficult-to-remove particles.

An advantage of this construction lies in the fact that the easiest-to-remove impurities are taken out in a separate chamber, so that when the partly clarified oil is subjected to the intense centrifugal action of the outer chamber the minute particles remaining in the liquid are removed without interference from the heavier particles. Another advantage is the large sediment-holding capacity of the double chambers, which permits of long runs before cleaning becomes necessary.

The oil is discharged from the multiple clarifier almost free from solid impurities, but it still contains a considerable amount of water. It is the purpose of the oil-purifying type of centrifuge to remove this water.

In operation, the oil to be purified is fed into the top of the bowl and passes down the center to the bottom, whence it flows out and up through holes in the disks and is distributed in thin layers between the disks. Here, due to centrifugal action, separation takes place. Since the water is heavier than the oil, it is thrown outward to the periphery of the bowl and passes upward along the outer edge of the disks to the discharge outlet. The oil, being lighter, passes inward between the disks, where the thin layers are subjected to tremendous centrifugal force, which throws out the remaining traces of impurities and water. These impurities are forced along the lower surface of each disk toward the sediment pockets, while pure oil is forced toward the center and from there upward to the oil-discharge outlet.

The disks in the purifier bowl divide the liquid being purified into thin layers. This enables a finer purification with less centrifugal force than if the entire contents of the bowl were treated in a mass.

The bowl of the oil purifier is surmounted by three covers, the top one serving as an overflow outlet, as already mentioned. The purified oil is collected in the second cover and discharged through the spout. The water is collected in the lower cover and is likewise discharged. It is worth noting that if pure oil be fed into the purifier bowl, there will be no discharge through the water-discharge outlet; while if water only be passed through the bowl, nothing will come out of the oil outlet.

A common method of handling the oil used for the average run of machine shop work is to return all of the used oil to a central cleaning station, purify it and then pump it back to the machines or storage tanks. Plants using such a system often attempt to settle the impurities out of the oil. This method is not entirely satisfactory for the following reasons:

1. The force of gravity is not strong enough to purify the oil completely.

2. A large quantity of oil must be thrown out periodically with the sludge which settles to the bottom of the tank.

3. The settling process is slow, usually requiring the application of heat, so that a considerable quantity of oil is "tied up" while being purified.

In Fig. 1 is shown a typical arrangement for handling oil at a central cleaning station where a multiple clarifying type of centrifuge is used.

Two tanks are used. These tanks alternately hold clean and dirty oil. Each tank has twice the capacity of the pipes and machine sumps in the plant. Let it be supposed that one tank is full of dirty oil, while the other is nearly empty. Valves are opened so that a part of the dirty oil coming from the machines passes through the multiple clarifier, or centrifuge, and from that machine into the second tank. The balance of the oil flows into the first tank, from which it is pumped back to the machines. As the second tank fills up with clarified oil, the other one empties. When there is but little oil left in it, an automatic signal is given and one set of valves is closed and the other is opened.

This process is repeated as often as the tank from which the machines are being supplied becomes nearly

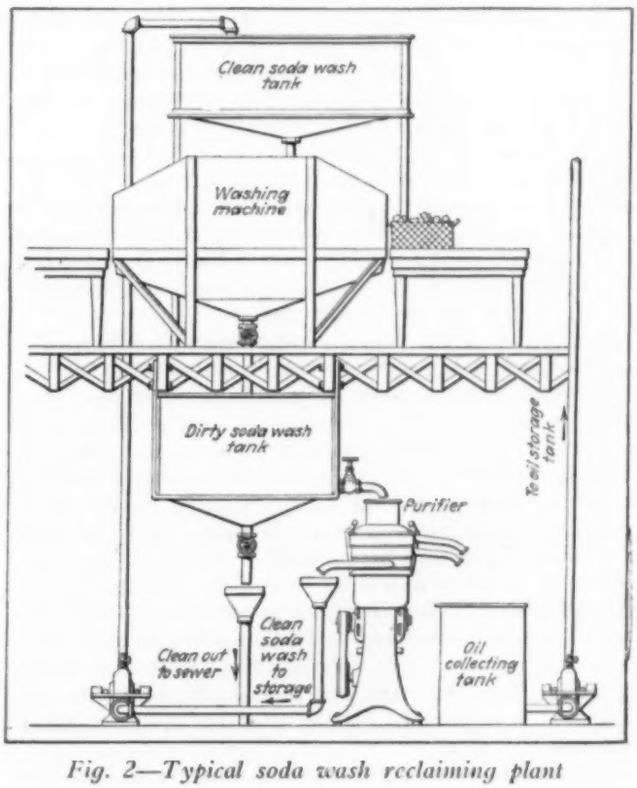


Fig. 2—Typical soda wash reclaiming plant

empty of oil—usually about every 5 or 6 hours. Thus the total amount of oil in the system is kept comparatively clean at all times, and every five or six hours a batch of absolutely clean oil is put to work. Advantages of such an oil-cleaning system wherein a centrifuge is used are essentially as follows:

1. The oil is returned to the system in a condition about equal to new.
2. The waste of oil with sludge is stopped.
3. The work is done instantaneously.
4. There is no longer need for an individual oil pump on each machine, since with this system one pump lifts the oil from the clarified-oil collecting tank back to the machine floors and delivers the oil to the cutting point at each machine. This arrangement almost eliminates the expense of operating and maintaining pumps; further, since the one pump is larger, pumping is done more efficiently.

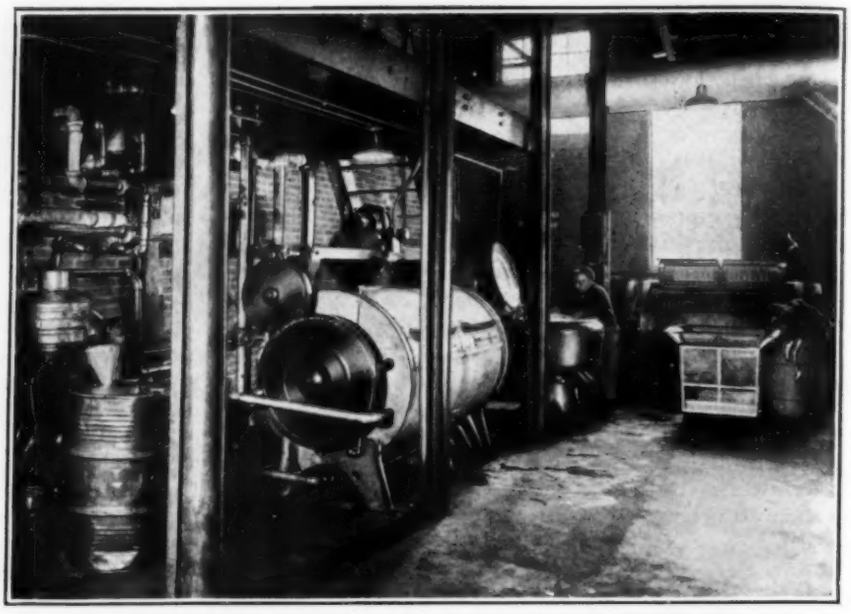


Fig. 3—Laundry and centrifuge for reclaiming wiping rags

In tapping pipe fittings or cutting threads on iron pipe, large quantities of cutting oil must be used. Only a small proportion of the oil that adheres to the chips can be recovered by the usual reclamation methods. This is particularly true of cast-iron chips, which are granular in form, and hold oil as does a blotter.

By employing a basket chip extractor that makes use of centrifugal action, and in which live steam is applied to the chips, almost all of the oil is readily removed. Running the oil so recovered through both the multiple-clarifying and the oil-purifying types of centrifuges removes the finer particles of metals that are forced through the holes in the extractor basket, and separates the water from the oil.

Another waste of oil that occurs in nearly every plant, but which is particularly great in the pipe shop, is the loss of oil in soda wash. A considerable amount of oil will adhere to any finished part, but it is easily understood how pipe fittings will hold an even greater amount of oil. When such parts are put into the washing machine the soda water quickly becomes saturated with oil. This makes it necessary to put in fresh wash water frequently. Losses in this washing operation are twofold, caustic soda and oil. Some manufacturers have installed centrifugal equipment in connection with a system for saving this soda water and oil.

In Fig. 2 is shown the general arrangement of a system for reclaiming oil and soda wash wherein use is made of centrifugal force. The operation of this system is as follows: The soda water is stored in a large tank above the washing machine. When the water in the washing machine becomes dirty, it is allowed to flow from the washer into the dirty oil tank on the floor below, and fresh water is drawn from the overhead tank to fill the machine. By opening a valve on the tank holding the used wash water, the latter is allowed to flow through the centrifuge, which separates the oil from the soda water, and also removes the metallic particles that are in the water. Clean soda water is pumped from the centrifuge back into the overhead tank, while the oil recovered is delivered to the oil-storage tank free from soda water.

At one plant cutting compound is used to cool the punching tools of a battery of drawing presses working on copper radiator tubes for automobiles. The oil drains to a small reservoir at the bottom of the machine, where a large quantity of copper chips settles out. The overflow from this reservoir goes to a small tank and is then pumped to a multiple clarifying type of centrifuge. After the oil is clarified it is pumped into a tank on the floor above, from which it flows by gravity back to the machines. The clarifier removes all of the fine copper chips and also a large quantity of copper acetate. The use of this centrifuge has eliminated the trouble that was formerly caused by the fine particles of copper in the oil getting on the punching tools and causing imperfect tubes.

Many industrial plants use so large an amount of rags for wiping machinery and similar purposes as to make their purchase a considerable item of expense unless a means is provided so that they can be re-used. In addition, unless such rags are washed and suitable oil-recovery equipment installed, the oil contained in the rags is also lost.

In one plant, rag-washing equipment that included a centrifuge, recovered 750 gal. of cutting oil from 15,000 lb. of rags in a year. These rags were washed and put back into service. This installation saved more than $1,700 for this company in a year's time. In the operation of this equipment the washing solution is circulated from the rag-washer to the centrifuge, and back again in a continuous cycle throughout a 30-min. washing period. The dirt removed from the solution is retained in the bowl of the centrifuge, while the oil is discharged into a suitable receptacle.

About 45 Years Ago

Columbus, Ohio, capitalists have decided to offer $20,000 and seven acres of land as an inducement to a firm of agricultural implement manufacturers to locate there.

* * * *

The Pratt & Whitney Company, Hartford, Conn., is employing a force of 800 men. It has orders for nearly 300 engine lathes, besides other tools.

Observations on French Shop Practice

By K. H. Condit
Editor, American Machinist

IN MAKING observations on French shop practice the American visitor must first overcome the handicap of a different language, provided, of course, that he is unable to carry on a conversation in technical French. Not having that gift, I was compelled to work through an interpreter, and that is a serious deterrent to the frank discussion of basic problems no matter how able the interpreter may be. Consequently my observations were visual ones, for the most part, and I feel sure I did not get as far under the surface as I might otherwise have done. My visits had all been arranged by letter or by telegram yet in several places there was a distinct air of doubt until my mission had been very carefully explained. Everything was most polite, of course, but it was a guarded courtesy until the doubt was dispelled. Then I was shown everything I wanted to see. Please remember that the shops visited were carefully selected as the best in France and that the practice observed was far better than that obtaining in the average shop. One of the customs of the country that must be taken into account by the foreign visitor is the stopping of everything from noon until two o'clock. Your Frenchman enjoys his mid-day rest and meal and you might just as well enjoy it too. He usually work long hours, however. One of the largest shops on my list was visited, by request of the management, on Saturday afternoon.

All of the plants visited, except one, were housed in single-story buildings, the newer ones generally of reinforced concrete. Where saw-tooth roofs are used they are of the type familiar in the United States. Artificial lighting seems inadequate to anyone conversant with the best American practice in this particular. The shops are clean and well-kept, however, mostly by women who do the greater part of the heavy cleaning in France, even of the streets in the smaller towns.

A few of the simpler machine tools used are of French make and there are also some British and German tools, the latter mostly on reparation account, but the great bulk of the machine equipment is American. With one exception, the handling equipment observed was of the most elementary sort. The wheelbarrow in various modifications is as generally used as is the electric truck in America. Labor is cheap and there seems to be plenty of it. Thus it is possible to have aluminum crankcases scraped and polished by hand at no very great cost, the work being done by women. Quite a number of heavy machines are operated by women, wonderful physical specimens that look at least as strong as the average male worker.

Many operations are still performed on engine lathes that might be transferred to more productive machines. Planers are accepted as the standard tool for finishing flat surfaces. Multiple jigs and fixtures and progressive dies are extremely scarce. Hand-operated presses are widely used. In a word, the product is built rather than manufactured. Much hand work and fitting is common practice and the result, though good, is expensive. One gets the impression that very few executives have visualized the manufacturing problems as a whole, or that, if they have, the complete co-ordination desired has been impossible to secure. Some machines in a department may be operating at high efficiency while others will be either entirely inadequate or not working at anywhere near capacity. No great thought has been given to the question of getting work from one machine to the next. In other words, co-operation is rather the exception than the rule, a natural result, perhaps, of having men at the machines so highly skilled that they are too fussy.

> American machine tools are popular in French shops and widely used in the best ones. Handling equipment is elementary and hand finishing is employed to a considerable extent. Belt drives are the rule and masonry or concrete the most used building materials. Taxation is very heavy and it is difficult for the manufacturer to escape it

What I have just said is a sweeping general statement, and therefore loaded with dynamite. But it is based on personal observations in some of the best plants and is backed up by the statements of engineers who are familiar with many French plants.

One very frank statement was made to me and I am inclined to think it may be justified. It came from the manager of a large railroad "back shop," a shop, incidentally, where there is a special machine for grinding locomotive cylinders. This gentleman remarked that he had sent five engineers to the United States to study railroad repair shops, and that they had found nothing in American practice worthy of adoption. In his shop I saw copper alloy flue sheets, flues and staybolts in process. They were going into some old American war locomotives.

Railroad shops are apparently not so very different the world over. Here in France was a wheel lathe with the

date 1859 cast in the base and a gear with broken teeth replaced by filed studs. It was working the day I was there.

As in England, belt drives are almost universally used. Flexibility of arrangement is apparently of little interest and the machine with built-in motor drive is the exception.

Contrary to English practice, the French custom seems to be to use the board drop hammer in the forge department. An occasional heavy belt drop is in use but it is the exception rather than the rule.

The automobile shops of France are apparently far ahead of other metal working shops, just as is the case in the United States. With one exception, however, the daily output is very small as compared with that of American plants. Much more fine hand finishing is done than seems really necessary yet the finishing of cylinder bores by means of a rolling tool is considered acceptable, just as it is in England. This practice is not universal, of course, for some of the makers employ grinding or honing machines, or both, for the job. Most of the crankshaft bearings are scraped by hand. The combination of small production and a large amount of hand work naturally runs the cost up until it seems fair to say that it costs almost twice as much in France as in the United States to produce a car of the same general size and quality.

Motoring, as a consequence, is still very largely regarded as a sport rather than a utility. Sport roadsters and touring cars, always with the tops down, are common on the roads, the occupants dressed in leather helmets, goggles and leather coats and leggings, or dust coats. I should guess that the proportion of open to closed cars in France is almost the reverse of that in America.

Foremen Training Unheard of

Foreman training, or anything else of that nature, is apparently unheard of. I asked about it at several plants but had quite some difficulty in explaining what I meant. Perhaps it is not so necessary in shops where most of the men are all-round mechanics capable of carrying a job through from start to finish.

There are many women operators in some, at least, of the French shops. Like their English sisters, most of them wear silk or near-silk stockings to work. Unlike them, however, they do not stick folded paper into the tops of their shoes. They accomplish the same end by slipping woolen socks on over the other ones and removing them when they finish work at night. This is not, possibly, an important technical observation, but few observers can be trusted to observe nothing but technical details.

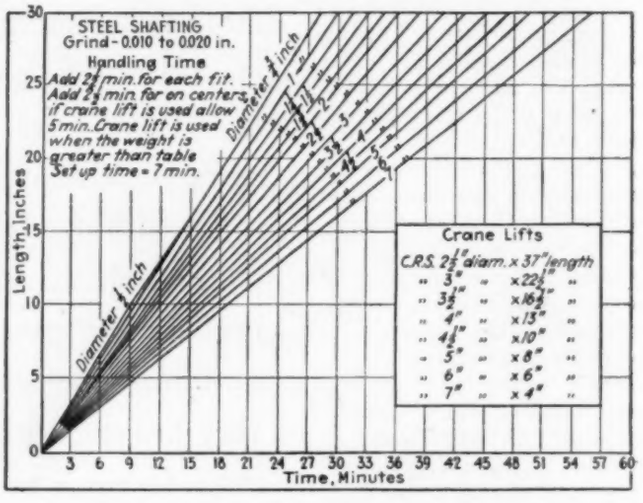
Among those most conversant with French manufacturing problems there is general agreement that there is not enough interchange of visits and information between engineers and manufacturing executives. My own observations were too fragmentary to permit me to venture an opinion on this point. I do believe, however, that visits to American plants would be helpful and that most of them would lead to more education than the mission to the railroad repair shops mentioned earlier. Certainly, the experience of the one French automobile manufacturer who has ventured largely in that direction indicates that it may pay big returns.

In commenting on the French industrialist's problems the tax question must not be overlooked because of its effect on everything he does. One Paris business man told me that in five years his company, which is capitalized at 500,000 francs, paid taxes of 492,000 francs. There are unpleasant stories afloat in France regarding the ability of the farmers to evade taxes. The manufacturer, on the contrary, has little chance to evade his taxes, whether he wants to or not, and they are no small item in his list of worries.

Using Charts in Estimating Operation Time

By W. C. Boston

IN A shop manufacturing a varied product, where the product is constantly changing and it is impossible to get a time study on every job, it has been found practical to take a few time studies on each class of work, and then make up a chart covering all sizes in the class, basing the chart on the time studies that have been taken. A chart of this kind is shown in the accompanying illustration. It shows the time required to grind steel shafting on a cylindrical grinder. It will be noted that the cutting


STEEL SHAFTING
Grind - 0.010 to 0.020 in.
Handling Time
Add 2½ min. for each fit.
Add 2½ min. for on centers,
if crane lift is used allow
5 min. Crane lift is used
when the weight is
greater than table
Set up time = 7 min.
Diameter ¼ inch
Diameter ½ inch
Crane Lifts
C.R.S. 2½" diam. x 37" length
" 3" " x22½" "
" 3½" " x16½" "
" 4" " x13" "
" 4½" " x10" "
" 5" " x8" "
" 6" " x6" "
" 7" " x4" "
Length, Inches
Time, Minutes
0
5
10
15
20
25
30
3 6 9 12 15 18 21 24 27 30 33 36 39 42 45 48 51 54 57 60

Typical chart of machining time based on time study, and used for estimating

time and the handling time are separated from the actual machine time, and are given in the upper left-hand corner. The sizes requiring crane lift are shown in the lower right-hand corner. The actual cutting time is read at the bottom of the chart. One of the variables, the length to be ground, is read on the left-hand border, and the other from the sloping line. From this chart a limit can be set on any piece of steel shafting that is to be ground on a cylindrical grinder.

Any kind of similar work can be plotted on charts. Before starting to make the chart, the time studies must be thoroughly analyzed and divided into three factors, the time for rigging up of the machine, the handling time, and the cutting time. The rigging up time and the handling time are constant, and should be handled separately, but the cutting time is the variable and should be charted according to the variables. On milling machine work, for example, the width, length, and depth of the cut will all affect the time, and in making a chart each line will take care of two variables. If there are more than two variables, different lines must be added to take care of the additional ones.

Heat-Treating Equipment
In a French Motor Plant

Photographs by courtesy of Andre Citroen, Paris

Fig. 1—Furnaces and recording mechanism used in the Citroen ball-bearing department. The control apparatus is across the aisle from the furnaces, and a quenching tank is provided for each furnace

Fig. 2—Types of furnaces used for heat-treating crankshafts, camshafts, piston pins and similar parts. The doors are counterbalanced and are equipped with water screens. A roller conveyor aids in handling the work

Fig. 3—Method of handling car loads of material to be heat-treated or carburized. The size of the furnaces can be realized by comparison with the men. The cars are hauled to any oven, and in and out of any oven, by wire cables

Welding Methods in Making Refrigerator Liners

By Frank W. Curtis
Western Editor, American Machinist

Liners are made in three sections welded together in a fixture, and then dressed off at the seams so that smooth, air-tight joints are produced

SHEET-METAL liners for refrigerators, made by Servel, Inc., at its Evansville, Ind. plant are made of three sections which are afterward joined together by acetylene welding. The material is 18-gage Armco enameling stock that is blanked and formed by press tools to the shapes outlined in Fig. 1, which is a sketch of a liner for the domestic unit. The welding operation is somewhat unusual, because the joints are butted together instead of being overlapped. By means of a well-devised fixture, the welding of the three sections is easily handled. To permit the removal of an assembled liner from the fixture, the two clamping frames are hinged as illustrated in Fig. 2. Cables carrying weights are attached to the frames so as to counterbalance their overhanging weight when they are swung open. The main body of the fixture forms a rectangular frame over which the liner sections are placed. It is hung on trunnions so that it can be swung into convenient positions to facilitate welding. With the liner sections in place, the clamping frames are swung over the ends of the fixture body, being held securely by a steel strap that connects them, as shown in Fig. 3. In addition, four plugs, one at each hinge, are inserted through bushings in the clamping frames and the fixture body to add rigidity.

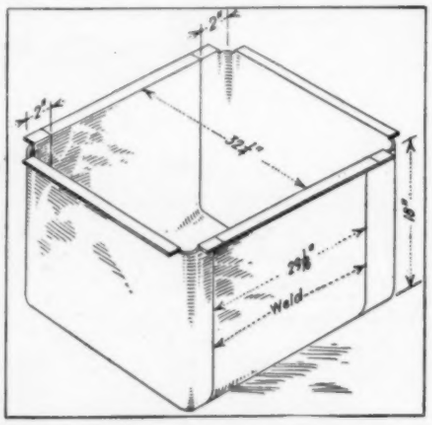


Fig. 1—Constructional diagram of a three-piece liner for a domestic refrigerator

Clamping of the liner sections is accomplished by 20 setscrews in each clamping frame. Clamping can be started at either end of the seam. The setscrews are tightened consecutively until the seams have been properly joined. Two operators handle the clamping, one on each side of the fixture. Crank wrenches are used so as to simplify the work. Within the fixture body is located a toggle device, operated by a lever that projects at one end of the fixture. This device expands plates that force the inner faces of the liner sections, adjacent to the seams, against the clamping frames. By releasing the toggle after welding, the liner can be easily removed.

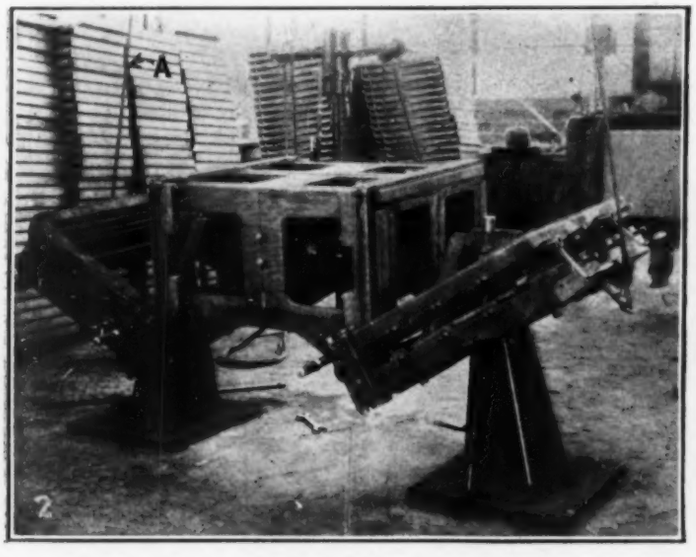


Fig. 2—A well-devised fixture that simplifies the welding of liners. Three sections of the liner are placed in the fixture and are then tightened by twenty setscrews. A toggle device within the fixture body expands plates that force the liner against the clamping frames. Fig. 3—The fixture loaded, showing two operators welding the seams. The fixture is mounted on trunnions, so that it can be rotated as the welding progresses. An oxyacetylene flame is used, and the welding rod is made from scrap left from the blanking operations

Fig. 4—Filler plates are welded to the corners of the flange to fill up the gap produced when the side sections are blanked. The plates are held in place by clamps until their edges have been "tacked" to the flange, then the clamps are removed and the welding is completed. The welded seams are smoothed by applying the flame to the joints until the welded metal has been distributed evenly over the flange

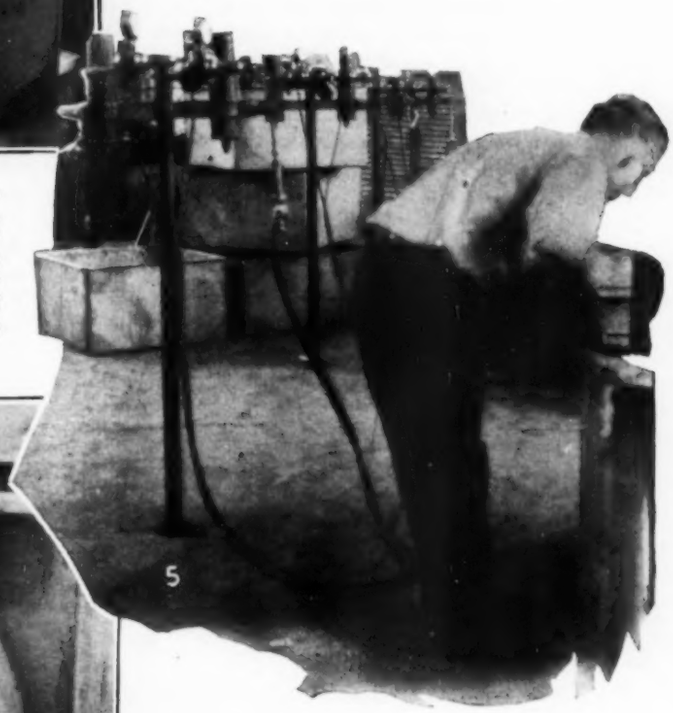


Fig. 5—The supply of gas is distributed by underground pipes to the shop, where it is made available from ten stands each equipped with outlet connections. Each stand has two sets of outlets and pressure gages. Connections are made by merely attaching the hose lines to the stand and opening the valves until the desired pressure is indicated

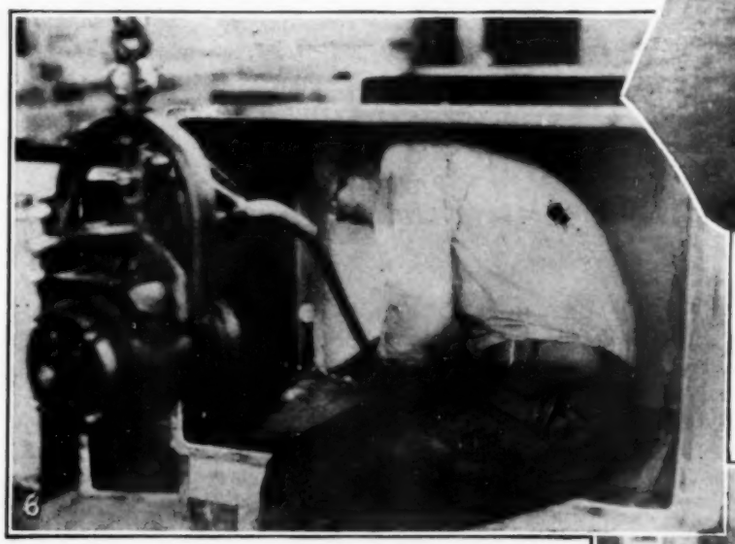
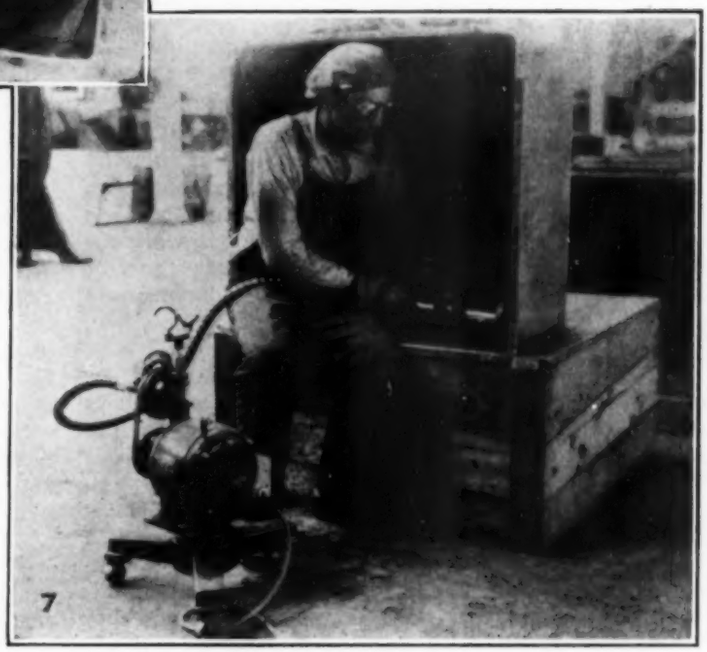


Fig. 6—Welded liners are dressed on the inside to remove any superfluous metal that is left on after welding the seams. The corners of the joints, which cannot be reached by an abrasive wheel are dressed by a steel burr driven by an overhead motor suspended from a pulley

Fig. 7—For the balance of the seams, a portable grinding unit is used as shown. An abrasive wheel is passed over the butted joints until the surfaces are smooth. After the joints have beeen dressed, the liner is washed and enameled, making it ready for assembly. It is practically impossible to detect the welded seams after the enamel has been baked.



With the work in place, the operators start welding the seam from the open side and continue around the liner until it is completed. The clamping frames are open in the center, so that the seams are in the clear and accessible to the torch. Likewise, the supporting surfaces of the fixture body are positioned to one side of the seams so that the torch flame cannot do any harm if it should pass through the seam. The trunnions are provided with binders to enable the fixture to be clamped in any convenient angular position desired as welding proceeds.

The welding rod used is of the same material as that of the liners and is made from the scrap cuttings left over from the blanking operations. With little experience, the operators make a joint that is smooth and airtight, and requires little dressing. The liner is welded in approximately 15 min., floor to floor time.

Inasmuch as the corners of the liner are rounded to radii of $\frac{1}{2}$ in., it is impossible to form the corner flanges of the end sections, therefore, the end blanks are made without flanges at the corners, and filler plates are welded to the straight flanges as shown in Fig. 4. The plates are held in place by clamps until they have been "tacked," then the joints are smoothed off by the torch. With the completion of this operation the liner is ready for dressing.

A separate building, adjacent to the welding department, houses the supply of acetylene and oxygen, which is transferred by underground piping to the shop. The equipment includes 4 acetylene generators, each having a capacity of 400 lb., and 20 oxygen tanks that are connected in two series of 10 each, so that gas can be drawn from either series, thus maintaining a reserve supply. The acetylene generators are equipped with valves that permit the gas to be drawn from any one desired. In addition to this equipment, a separate room in the building is provided for the storage of carbide. Pressure gages are attached to the outlet connections of the acetylene and the oxygen lines, thus the attendant can readily check the pressures and be prepared to draw the supply from another unit when necessary. The maintenance of these supplies requires but a fraction of the attendant's time, therefore, he can devote the greater portion of his day to other duties in the shop.

The outlet connections in the welding shop, of which there are ten, are supported on stands, positioned approximately 8 ft. apart, as illustrated in Fig. 5. Each stand has two sets of outlets that are individually controlled and equipped with pressure gages. To make a connection at a point convenient to the work, it is necessary only to attach the acetylene and oxygen hose assembly, which includes the torch, then open the valves until the proper pressure is indicated on the gages.

The welded joints on the inside of the liners are dressed by portable burrs and grinders. In Fig. 6 is shown an operator smoothing one of the inner corners of the liner with a steel burr driven by a unit suspended from overhead. This operation is required on the surfaces that cannot be reached by an abrasive wheel. In Fig. 7 is illustrated a portable grinder being used to dress the balance of the seams. After completion of these operations, the liners are enameled and baked, in which condition it is practically impossible to detect the locations of the welded joints.

Men Over Fifty—*Discussion*

By Harry Kaufman

THE subject of the editorial in Vol. 69, page 70, of the *American Machinist*, is one that is being, and has been, discussed by many industrial executives. It has been found that the man past fifty has demonstrated his ability to hold the job on a purely economic basis. The men over fifty bring a better viewpoint of life to the job than most younger men can have. They are apt to be slow workers, but this failing is usually more than offset by their steadiness, application, and painstaking care.

Generally speaking, older men are good workers. It is difficult to compare the effectiveness of older workers with that of younger men, but comparative values can be estimated in this manner: A man of fifty has less energy than a young man, but he uses all of it, while the younger man with many distractions uses only a part of his. Therefore, it can be estimated that older men are about 10 per cent more effective than younger men, because of more efficient use of their energy.

Older men improve the morale. Some concerns use them to leaven departments, as stock rooms, where boys are employed. The youngsters are more or less given to rough-housing and congregating behind piles of goods to talk baseball. The presence of an elderly fellow employee has a sobering and steadying effect upon the young fellows. While he is not the boss, his age acts as a brake. Moreover, the older men have more of the employer's viewpoint of the business. They catch the ideals and ideas of the management, and so, even though they hold minor positions, have a good effect upon the other employees.

Most manufacturers readily agree that there are some jobs that can be filled satisfactorily enough by old men, such as night watchman, elevator man, doorman, and the like. However, a careful inquiry among those making a policy of keeping on the older men shows that they are filling practically all kinds of jobs. They are working as mechanics, machine hands, truckers, janitors, stock clerks, handy men, filing clerks, and in practically all kinds of office work. They are especially valuable in jobs that require contact with the public or where experience is required more than initiative.

Therefore, the several benefits derived by the company from the employment of men over 50 years of age, are steadying influence on factory morale, decreased labor turnover, and better application to and interest in the work. The first point can be made tangible by placing an old man in a group of boy workers. He will have a sobering effect even though he may have no authority among them whatsoever. Transferring the older workers whose experience, steadiness, and desire to hold their jobs is demonstrated, to easier and more suitable jobs is a means of dealing with the man past fifty.

Developments in X-ray work promise to revolutionize our knowledge of materials, and our methods of selecting and inspecting them.

Activity in the Metal-Working Industry

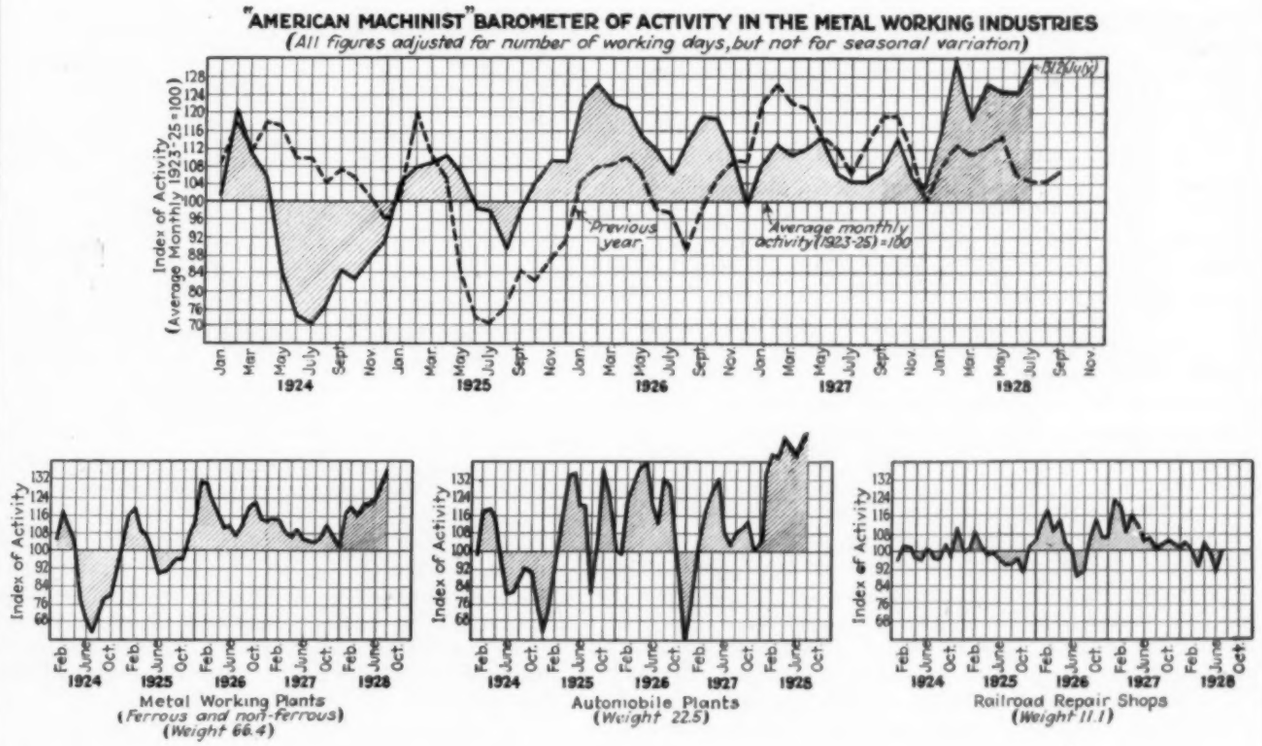
Operations Continue Above Those of Last Year

During July the metal working plants of the country reported that the rate of productive operations was about 5.7 per cent higher than in June, and 26 per cent higher than in July of last year. These figures are based upon preliminary data on the consumption of electrical energy by a large number of metal working plants scattered throughout the country. Since last November the operations of these plants have been materially above those of the corresponding month in 1927, but July witnessed by far the largest increase over the year previous. The indications are that the metal working plants of the country will continue to operate during the remainder of the year on a plane above that of the same period last year.

The ferrous and non-ferrous metal-working plants reported July operations about 29 per cent above those of last year, while in June they were about 17 per cent over last year. It is very unusual for these plants to maintain such a high rate of operations as is being recorded during the present summer. Usually, the July operations are near the lowest of the year, but this year the preliminary data indicate that July operations are the highest of the year. The automobile plants are operating at record proportions and at a rate about 50 per cent over last July.

General industry in the country also reported a July rate of productive operations well above that of last year. The basic figures on electrical energy consumption indicate that the volume of general production during the first seven months of the current year has been about 3.5 per cent above that during the same period in 1927. Nine of the primary industrial groups: rolling mills and steel plants; metal-working plants; leather and similar products; automobile, including the manufacture of parts; stone, clay, glass, rubber and allied products; chemicals and allied products; food and kindred products; and paper and pulp, turned out a volume of products during the seven months greater than during the same period in 1927, although in some of the groups the increased volume was slight. On the other hand, three important industrial groups, textiles, lumber and allied products, and shipbuilding, were operating during these seven months as a whole at a lower rate than in 1927.

The only weak spot in American manufacturing industry today is the textile industry. In July this industrial group was operating at a rate about 19 per cent lower than that during July last year, and the average rate of activity during the first seven months of this year was about twelve per cent lower than that during the same period last year.



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Why Some Trade Associations Fail

IN MAKING an analysis of the causes of the failure of some trade associations to realize fully their opportunities, E. St. Elmo Lewis, counsel in trade and consumer relations, National Services, Inc., of Detroit, in addressing an industrial group, recently, gave the following main causes for trade association failures:

(1) Failure to realize that a trade association is a business with unique problems of economic and human relationships, and that there is a special technique and experience necessary in organizing and conducting a trade association, just as there is in any other 1928 business activity.

(2) Failure to make a proper analysis of "the job to be done" by the trade or industry, which means fixing the relative position and tendencies of the trade; listing the various abuses and difficulties which retard its profitable progress, thus finding the trade problems common to the members as a basis of the association program.

Failure to realize the necessity for both administrative and executive leadership, thus putting the work of the association in the hands of cheap, incompetent, time-serving men who waste time and money in theoretical futilities or the selfish pursuit of personal ends.

(4) Failure to realize that busy men will not and cannot give the time necessary to working out the details of association operation—no matter how great their personal interest—and thus fail to provide for the selection and maintenance of a competent staff necessary to skilled execution of well-defined and considered policies.

(5) Failure to realize that the job of a trade association executive is not a sinecure for a friend, or a refuge for a business failure.

(6) The trade association fails whose membership expects its sales problems to be solved, its competition to become enlightened, its technical education to be developed, its public to become informed, at no greater annual charge to each member than the expense of a salesman's evening entertainment of a first-class prospect.

Trying to Evade the Anti-Trust Act

(7) The trade association fails that spends its money and time trying to evade the price-fixing provisions of the Sherman Anti-Trust Act, and thereby hoping to make real co-operation in the development of its markets, the education of the membership in better business methods, unnecessary.

(8) The trade association fails that exhausts its co-operative effort in passively "resoluting," or in drawing up vague ethical "creeds," or in formulating codes of practice that are impractical; or that expects, by merely displaying practical codes on office walls, it can automatically eliminate all the human cussedness that makes a warfare of business.

(9) The trade association fails when it does not furnish practical working data on production, finance, marketing, merchandising, advertising, sales, and general business control—and specialists who can interpret the data in such a way as to give each member a true picture of the tendencies in the whole trade and his relation to them.

(10) The trade association fails that does not realize in fixing its plan of organization, and program of operation, and in selecting its executive personnel, that the effective trade association is a co-operative method of furnishing skilled staff guidance to the entire trade in the keen competition between trades for a share of the consumer dollar.

(11) The trade association fails that stops at the golf-playing, good-fellowship stage, however much friendliness helps at every stage of a more practical program.

(12) The trade association fails whose members do not "play the game" because they are "too big and don't have to," or "so little it does not matter."

Mr. Lewis said, also, that there are four things every trade association must do:

(a) It must have an aggressive, faithful and competent leadership and a membership loyal to the purpose and plan.

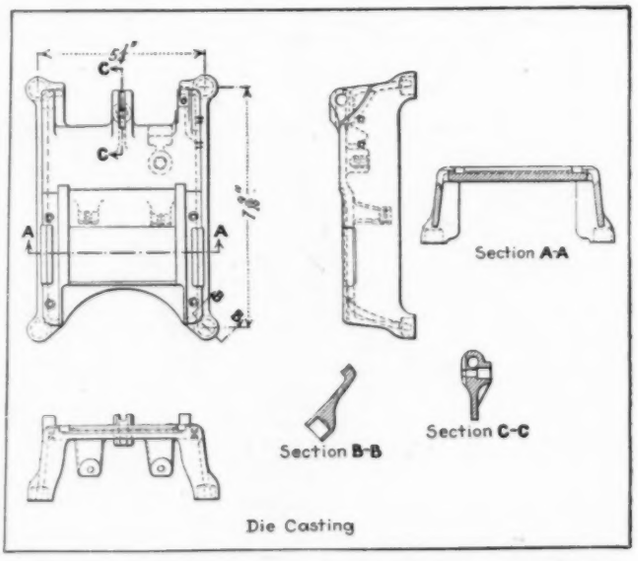
(b) It must have a plan of action based on a competent, unbiased analysis of the trade's requirements.

(c) It must have an adequate and competent staff to do the work.

(d) It must have a program that realizes the necessary time, and a budget that fully covers the expense of putting the plan into execution.

Cost Cut by Design Change

IN MOST cases where die castings can be used in place of some other form of construction, substantial savings are to be found. An outstanding advantage usually attained in a die casting is the elimination of machining operations. Then, in some instances, less material is required. Changing the bed, illustrated, from an iron casting to a die casting has resulted in a saving of 70 per cent in the cost per piece, figured, of course, on a quantity basis. The reduction is calculated from comparative costs, the actual saving being $142 per 100 pieces. A direct labor reduction of 92 per cent resulted from the change.



A die-cast bed, formerly made of cast iron, in which the change has created a cost reduction

A large automobile body builder uses enough lumber every year to build 60,000 homes.

IDEAS · FROM · PRACTICAL · MEN

The department, "Ideas from Practical Men," is devoted to the exchange of information on methods useful to the machinery industries. Its scope includes all divisions of the metal-working industry, from drafting room to shipping platform. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for. The rates are from a minimum of five dollars upwards, depending upon their merit

Slip Bushings for Drilling and Reaming

By H. J. Gustav Kopsch

May I suggest the following system for such jigs as require slip bushings, where holes are to be reamed after being drilled:

1.—Make all drill bushings with round, knurled heads, having a small flat at the front of each on which the size of the drill is to be stamped.

2.—Make all reamer bushings with octagon or hexagon

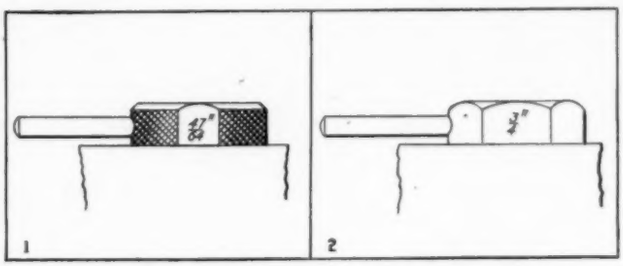


Fig. 1—Head of drill bushing. Fig. 2—Head of reamer bushing

heads, and stamp the sizes of the reamers on the front flats. The illustration shows both schemes.

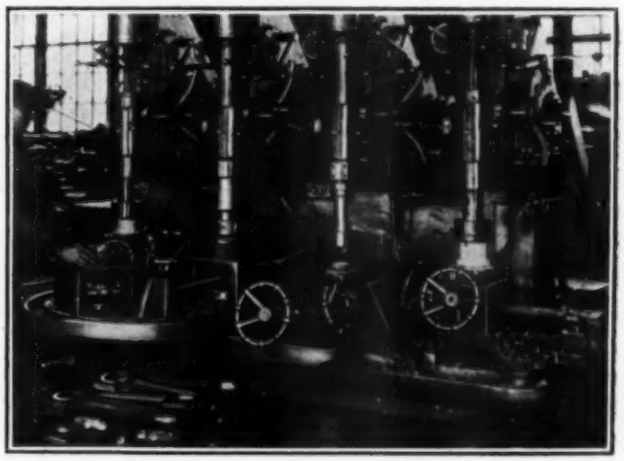
If this plan is systematically carried out, it will be the means of saving some reamers that would otherwise be spoiled by trying to jam them through drill bushings. The operator will soon associate the bushing having the round, knurled heads with drills, and the ones having hexagon or octagon heads with reamers.

All bushings for different sizes of holes should have different outside body-diameters, to make it impossible to fit them to any but their proper holes in the bushing plate. It will also be of advantage to have the heads of the bushings increase in diameter in proportion to the increase in the body diameter.

Tooling for Machining Connecting-Rod Bearings

By George H. Feltner

By tooling a four-spindle drill with two stationary jigs and one of the indexing-type, as illustrated, the machining of both ends of large connecting rods has been simplified, so that one operator handles three operations. The rods are for tractors, and are made of S.A.E. 1035 forged steel, the large end measuring $2\frac{3}{4}$ in. in length, being finished to 4 in. in diameter, and the small end, which is $1\frac{7}{8}$ in. in length being finished



A combination set for boring connecting rods

to $2\frac{13}{16}$ in. in diameter. The production is 10 to 12 per hour.

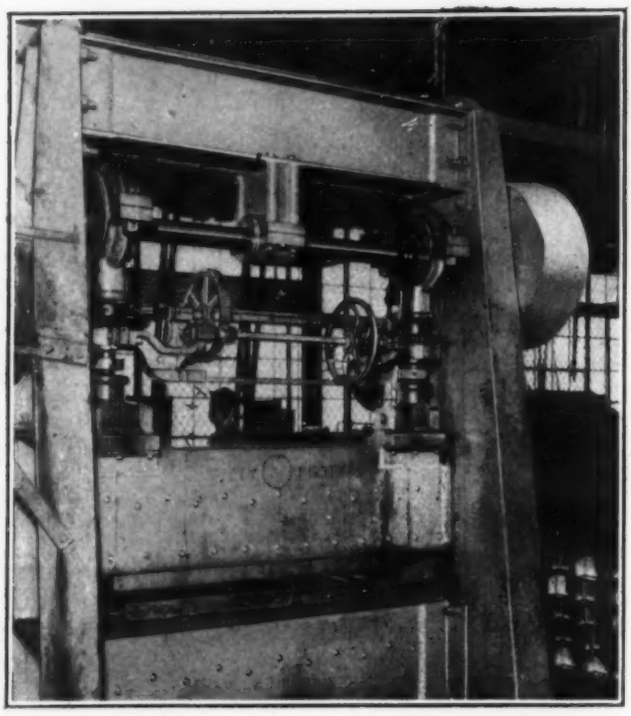
The large ends are rough bored by the spindle at the right, after which the rods are transferred to the jig under the next spindle where the smaller ends are rough bored, preparatory to being ground. The two spindles at the left, in conjunction with an indexing jig, finish bore and ream the large ends to size. Before being bored, the rods have been straddle milled at both ends, so that they are located from these previously machined faces. End location for the first two settings is from stop plates against which the smaller ends of the rods rest, and the holding is by adjustable clamps, operated by handwheels, which bear upon the larger ends of the rods. For the final setting, the small bores of the rods are fitted over a plug for end location, and the crankshaft ends are centralized by two setscrews.

Press Brake Repaired by Arc Welding

By R. B. Havens

A breakdown recently occurred in one of our main production machines—a 10-gage press brake. The machine has been worked to over capacity and the crown section cracked as a result. The crack was a serious one and we were faced with the necessity of purchasing a new machine.

A few months previously, a small General Electric arc-welding set had been purchased, and it was decided to attempt to repair the broken machine by arc welding. The three longitudinal sections of the machine — the crown, punch and bed sections—were cut out and new longitudinal sections were fabricated from steel channels, angle plates and pipe. Using the newly fabricated sections in place of the old cast sections, the machine was



Press brake repaired by arc welding

repaired and reassembled and was soon ready for work.

The original machine was 10 ft. wide, but the rebuilt machine was but 6 ft. wide, this width being considered better suited to our requirements.

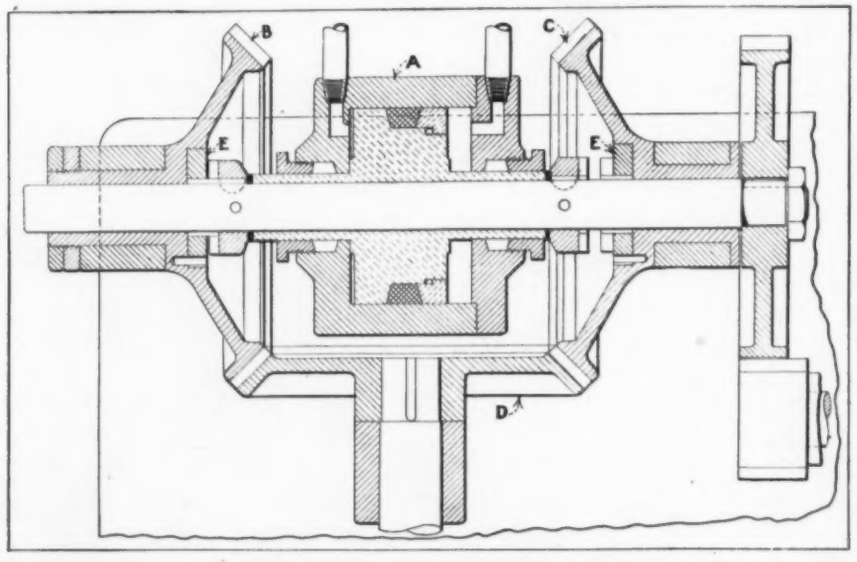
A new machine would have cost in the neighborhood of $2,000 or $2,500, while the cost of rebuilding the old machine by welding was but $550, including a new shaft, which was one of the principal items of expense and one not chargeable to the welding.

Air-Operated Reversing Gear

By J. E. Fenno

The reversing gear illustrated is used for reversing the reel on a paper machine, and is operated from a distance of 20 ft. by an ordinary 3-way valve. The device runs in bearings attached to the frame of the machine, to which the air cylinder *A* also is attached. The bevel gears *B* and *C* rotate continuously in opposite directions, being driven by the bevel gear *D*. The hardened-steel jaw clutches *E* are doweled to their respective gears, and the mating parts are keyed and pinned to the operating shaft. The packing on the piston is adjustable.

The spur gear at the right is keyed to the shaft and drives the pinion below it, which is attached to the reel shaft of the machine. As shown, the clutch at the left is in engagement, the air pressure being against the right-hand side of the piston. To reverse the mechanism, air is allowed to escape from the right-hand end of the cylinder, while air under pressure is admitted to the left-hand end. The piston then travels to the right, engaging the right-hand clutch. As the piston rod is confined endwise by the mating parts of the clutches *E*, their engagement with the clutches on the bevel gears is brought about by the sliding of the rod in unison with the movement of the piston. The bevel gears are collared in their bearings and have no endwise movement. Since the large spur gear has the same amount of endwise movement as that of the piston rod to which it is keyed, the face of the pinion on the reel shaft was made wide enough to allow for the endwise movement of the spur gear, and to preserve a full-width tooth bearing in both positions of clutch engagement.



Reversing gear operated by air

Triple-Action Swaging Tools

By Lucian L. Haas

The purpose of the tools here described is to make a gas-tight joint between the inner baffle *A*, the outer baffle *B* and cylinder *C*, all of which parts are shown enlarged in Fig. 1 in their relative positions and in place on the mandrel, or horn, *D*. Details of the tools are given in Fig. 2, and in Fig. 3 they are shown in the press in which they are used. In the latter illustration, one of the completed pieces can be seen lying on the bolster.

Referring to Fig. 2, when the levers *A* are moved outward, they move apart the holding plates *B*, permitting the work to be placed on the mandrel *D* with both of the baffles in position. Some difficulty was experienced in holding the inner baffle in place during the swaging operation, but we succeeded in making it a force fit in the cylinder and spot welding it.

When the levers *A* are moved toward each other, they close the holding plates upon the work, holding it lightly in position. When the punch *C* descends, the long wedges *E* enter the die and force the holding plates tightly against the collar of the outer baffle. Continued descent of the punch brings the short wedges *H* into contact with the angular projections of the swaging dies *K* and forces them together, swaging a bead upon the collars of both of the baffles and the cylinder. Upon the ascent of the punch, the work is given a quarter turn on the mandrel and another blow is struck, completing the operation and making a gas-tight joint. Depressing the treadle *L* brings forward the ejector *M* and strips the work from the mandrel.

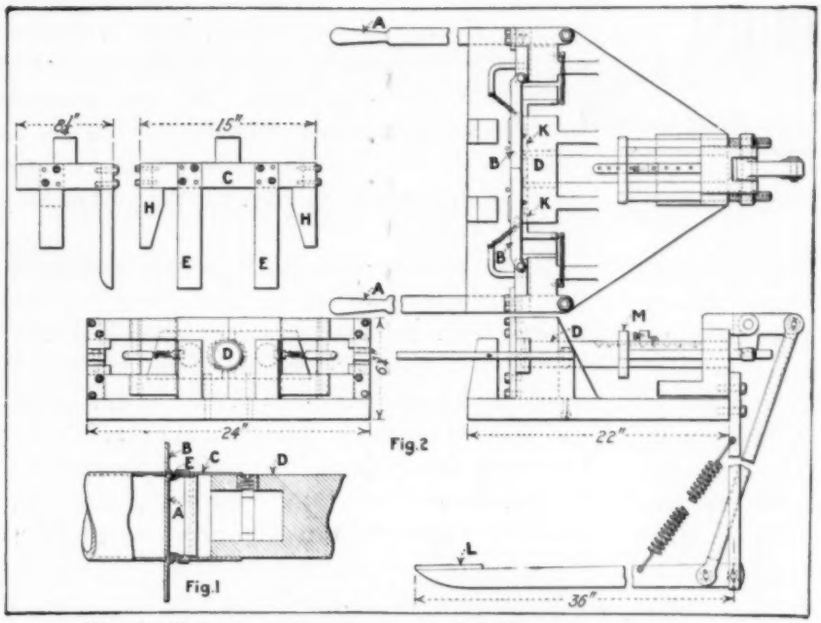


Fig. 1—End of mandrel showing both baffles swaged to cylinder.
Fig. 2—Details of the swaging tools

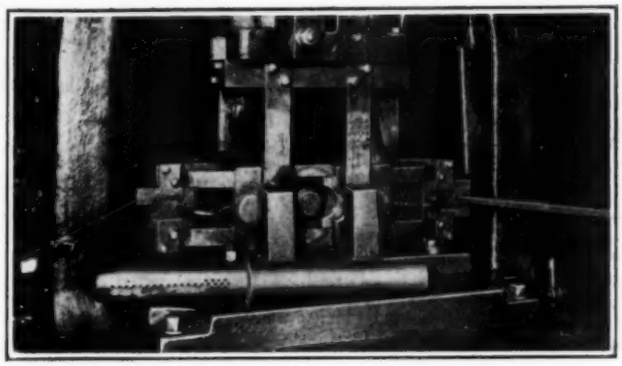


Fig. 3—Swaging tools in the press

In the drawing, Fig. 1, it will be noted that the end of the mandrel *D* is not provided with a groove to accomodate the bead formed by swaging. If it had such a groove, it would be impossible to strip the work from the mandrel after the bead has been swaged.

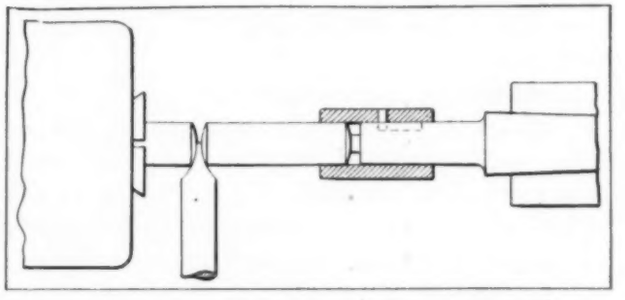
Production Tools for Rounded-End Pins

By E. F. Eberhard

We had a large quantity of rounded-end pins to cut off from cold-rolled stock. Having no screw machine, the job was done in an engine lathe. At first we tried cutting off the pins with a tool that was flat on one side and filleted on the other. By this method the pins were rounded on one end only, necessitating a chucking operation to round the other ends.

As this method was too slow, we made the tools shown in the illustration, by the use of which we were enabled to do the work at a good profit. The stock was held in a draw-in collet and was fed out against a stop held in the tailstock spindle. On the stop was a knurled sleeve, prevented from revolving, but allowed to move endwise a limited amount, by a pin engaging a slot. When pushed forward, this sleeve acted as a support for the outer ends of the pins while they were being cut off. The parting tool was filleted on both sides, so that both ends of the pins were rounded.

After a pin was entirely cut off, the sleeve was pushed back, allowing the pin to drop out. The small teats left on the pins in cutting off, were easily removed by a touch with a file. Thus, simple tools produced a pin with each cut.

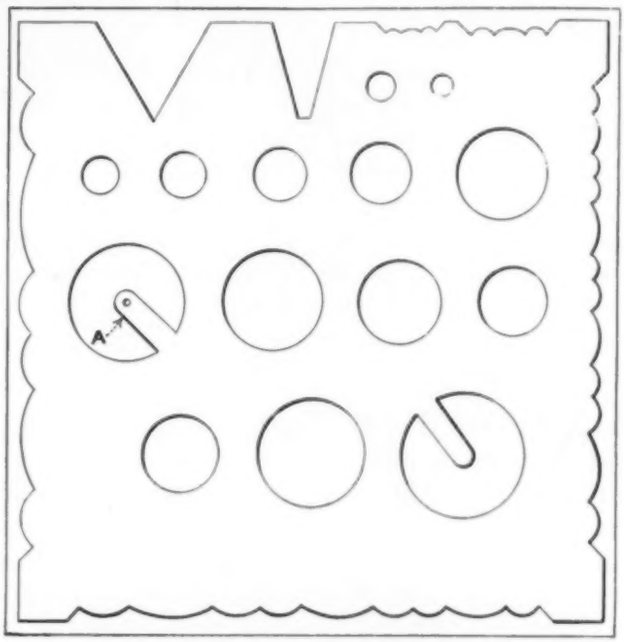


Set-up for making pins in an engine lathe

An Improved Fillet Square

By J. F. Bell

Most draftsmen are familiar with the draftsmen's fillet square and perhaps will be interested in an improved square of this type that I have devised. When using the fillet circles it is advantageous to be able to locate their centers particularly if the drawing has to be traced.



An improvement in fillet squares

I obtained a piece of sheet celluloid and duplicated the commercial square leaving a lug *A* in each circle, then drilled a No. 60 hole at the center, through which the center of the fillet can be transferred to the drawing.

American Machinist

Editors: KENNETH H. CONDIT AND FRED H. COLVIN

Established 1877

Metric Propaganda in England

METRIC propaganda is being directed against the industries of Great Britain as in our own country. Glittering generalities are being published by the metric advocates in that country to show how Great Britain is losing world trade because of its adherence to the antiquated inch. It does not, however, point out any great increases in world trade by metric using countries, and for the very good reason that the bulk of the world's manufacturing is done in English inches.

The usual arguments are advanced and in addition it is claimed that United States Consuls abroad and Chambers of Commerce at home are almost universally demanding the adoption of the metric system. This, we believe, will be news to most manufacturers in this country, and if true, indicates a need for educating both Consuls and Chambers of Commerce on the cost of making the change. Mr. Hoover will also probably be surprised to learn that by his advocacy of standards of quality and quantity he aligns himself with the metric advocates.

Prejudice should play no part in the adoption or rejection of anything as vital as measurement. The *American Machinist* has been and is strongly opposed to its compulsory adoption. In spite of its being favored by Government departments it is used very little in manufacturing in this country, far less than seems possible if it actually possessed the advantages claimed for it.

How Much for Engineering?

A MASS-PRODUCTION factory was making a certain piece and taking one and a quarter minutes to do the machine work. A machine-tool builder built a special-purpose machine for the job, and after installation in the production plant it produced thirteen pieces per minute, or sixteen times the amount of work formerly done. The machine-tool builder was paid $4,875 for the machine, and "just broke even" on the job. Another machine builder sold a machine that saved its cost every seven months for a production plant, besides greatly reducing the overhead.

These cases are not exceptions, but are every-day average conditions in machine-tool building today. Behind the building of these machines is an enormous fund of accumulated engineering knowledge and experience, yet the machinery builders maintain that if they did not bid low and "just break even," or be content with extremely small profits, they would not get the jobs of building the machines.

If this condition of affairs is true, it is at least one of the reasons behind the "profitless prosperity" that we hear so much about. Efficient buying is commendable, but close buying that would make possible large profits in one business and prevent adequate returns in another is not the best thing for business in general. This is an age of special machinery and mass production, but it must be remembered that labor-saving machinery is made possible only by engineering skill in design and workmanship, and the machine builders should have every opportunity to make a profit commensurate with the savings effected.

Standardizing Machine Tool Capacities

AMONG the projects for standardization is one to unify and simplify the sizes, or capacities, of machine tools. This does not mean that all machines shall be alike, but simply that a sixteen-inch lathe, for example, shall not swing much over sixteen inches.

Milling machine builders led the way in standardizing the sizes of machines, just as they have in the matter of spindle noses. And, though there may be slight variations, in most cases No. 2 milling machines of any make have approximately the same capacity as to table size and travel.

Wise buyers, of course, consider more than mere size in a machine. They want to know its weight, the power it can absorb in useful work, the cuts it can take or the metal it can remove per minute or per hour. But it is a great aid in making a decision to know that a No. 2, or a 20-in. machine of any make, has approximately the same capacity as that of any other similar machine of the same rating. In the case of radial drilling machines, for example, it has been suggested that a standard diameter of column be adopted for arms of various lengths.

Simplification in the number of sizes is also to be considered. It hardly seems necessary to have lathes and boring mills vary by such small increments as is now common. Eliminating sizes will reduce the inventory expenses of both builders and dealers and make it easier to ship the desired size more promptly.

Natco Model B-250-H Single-Spindle Hydraulic Drilling and Boring Machine

DRILL heads can be easily and quickly attached to this single-spindle hydraulic drilling and boring machine, which has been introduced by the National Automatic Tool Company, Richmond, Ind. As shown in the illustration, the head carries four spindles, and is driven by a single spindle. The machine has a semi-automatic hydraulic feed, the operator pulling the air valve to start the feeding of the head which rapid traverses down, goes into the drilling feed, drills to correct depth, rapid traverses back to starting position and stops. The positions at which these various operations take place, and the amount of travel of each, are adjustable by sliding trip dogs fastened to the sliding-head flange. The rate of feed is controlled by adjusting a valve which is within easy reach of the operator. All working parts of this valve are completely inclosed, thereby keeping out dirt and also adding to the safety of operation. The machine has capacity to drill 2½-in. holes in steel at 0.010-in. feed.

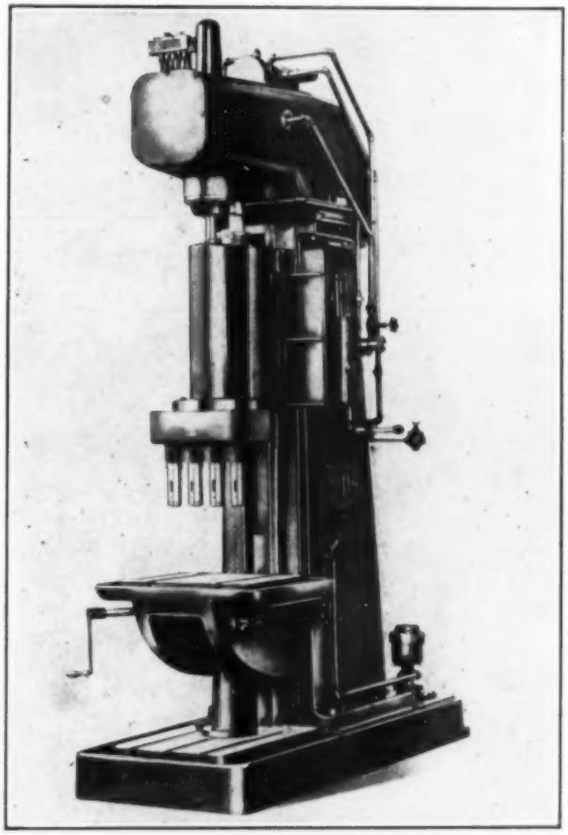
Rigid Construction

The rigid base is 8 in. deep, and has 1-in. ribs running both lengthwise and crosswise. Extra-heavy construction is used directly under the flange of the column, and the working surface is 22x29 in. Three T-slots run lengthwise through the base on 7-in. centers, and a wide lubricant channel extends along each side and across the front, draining into a large reservoir cast in the rear of the base. Rigidity, to support the head without deflection under capacity loads, is obtained by the use of a box section 20 in. wide and 31 in. deep at the bottom, and tapering to 16½ in. wide and 21¾ in. deep at the top. It has 1-in. walls. The ways are of the dovetail type, extending the full length of the column and 8 in. across, each having a bearing surface 1½ in. wide and 2 in. deep. An oil reservoir is cast in the top of the column with a capacity of 25 gal., and two large openings in the rear at the bottom permit adding of auxiliary counterweights when desired.

The head has one large No. 5 Morse tapered alloy steel spindle which is ball bearing mounted. The ways of the head are 23½ in. long, and a heavy flange on the lower face provides a rigid support which does away with the necessity for guide rods. It is cross-slotted at the end for heavy driving. The distance from the center of the spindle to face of the column is 14 in., and the length of feed is 20 inches. Maximum distance from spindle to table is 38 inches.

An adjustable knee-type table is used. The minimum height of the working surface is 28 in. with an adjustment of 17¼ in. The table is raised or lowered by means of a removable crank which turns the adjusting screw through a horizontal shaft and bevel gears. The knee is supported by a long bearing on the column and by the adjusting screw which is located directly under the center of the working area of the head. A lubricant channel 3¼ in. wide and 2 in. deep surrounds the working surface of the table, which is 20x26 in. in area. Two T-slots are provided for clamping fixtures or a rotary table. Direct motor drive is used. The power is applied through a horizontal shaft mounted in ball bearings, to a train of heavy heat-treated alloy steel change gears, and then to a set of heavy heat-treated alloy steel spiral bevel gears direct to the spindle proper. A 10-hp. motor is used that operates at 1,200 r.p.m. The machine is equipped with pick-off gears which will give one spindle speed, with speed changes from 93 to 329 r.p.m. However, the machine can be equipped with a special slow-speed head to give spindle speeds from 25 to 100 r.p.m. for boring.

One 6½-in. low-pressure oil cylinder actuates the head. It gives a pressure of approximately 6,600 lb. If an emergency stop is necessary at any time, pushing in on the handle of the air valve starts the head into rapid reverse, and it automatically stops when the starting position is reached. The pump and oil reservoir are located on and in the top of the column, respectively, the pump being driven from the main drive shaft. A constant-speed pump is used, and is equipped with a by-pass which allows the excess oil to return to the reservoir when a given pressure has been reached. This feature protects the drills, and should an unusually hard spot be struck, the pressure cannot be built up beyond the correct feeding pressure. All valves in the oil



Natco Model B-250-H Single-Spindle Hydraulic Drilling and Boring Machine

piping system are conveniently placed for the operator.

Changes of feed are made by adjustment of the control valve on the right-hand side of the column. Any feed from 0 to 15 in. per min. can be obtained. The rapid traverse rate is 70 in. per min. Lubrication of the machine is by means of an oil box located above the change gears on top of the neck, and gravity feed to all points of wear.

The floor space required is 34x85 in. and the height is 131 in. The weight of the machine with plain table is 8,000 pounds.

Mackintosh-Hemphill Roller Bearing Equipped Roll Lathes

TWO direct-motor-driven, heavy-duty roll lathes have been placed on the market by the Mackintosh-Hemphill Company, Pittsburgh, Pa. Both lathes are equipped with roller bearings on all gear shafts so that they operate with a minimum amount of friction and require a minimum amount of attention from the operator.

The 36-in. roll lathe shown in Fig. 1 has a headstock equipped with roller bearings and provided with oil spray lubrication for the gear teeth and pressure grease lubrication for the bearings. The motor is mounted directly on the headstock, and is connected to the headstock drive through a flexible coupling. Two rolls 8 ft. 6 in. long and 36 in. in diam. can be turned simultaneously. The lathe shown in Fig. 2 is designed to operate at speeds ranging from 0.73 to 6.5 r.p.m. It will take a roll 31 in. in diameter. A totally-inclosed headstock which permits the gears to dip in a bath of oil in addition to spray lubrication is provided.

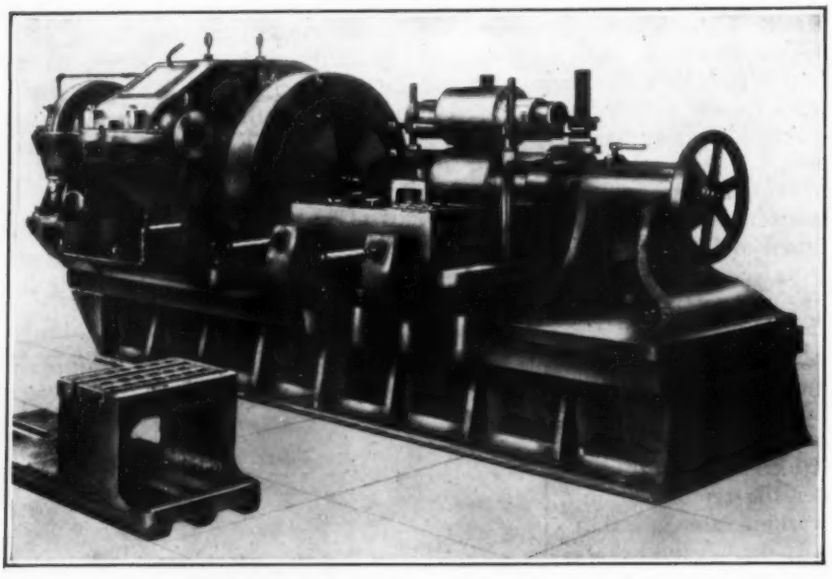


Fig. 1—Mackintosh-Hemphill 36-Inch Motor-Driven Roll Lathe, Roller Bearing Equipped

Allis-Chalmers Type ARZ Totally-Inclosed Fan-Cooled Motors

This line of totally-inclosed fan-cooled motors, in sizes from 1 to 50 hp., has been developed by the Allis-Chalmers Manufacturing Company Milwaukee, Wis. As shown in Fig. 1, the exterior shell is composed of two castings at either end, and a steel-plate formed section in the central portion. At the end away from the pulley, a fan is mounted on the shaft and sucks air through the wire-mesh screen, and blows it over the iron casing surrounding the motor windings. This fan is suitable for

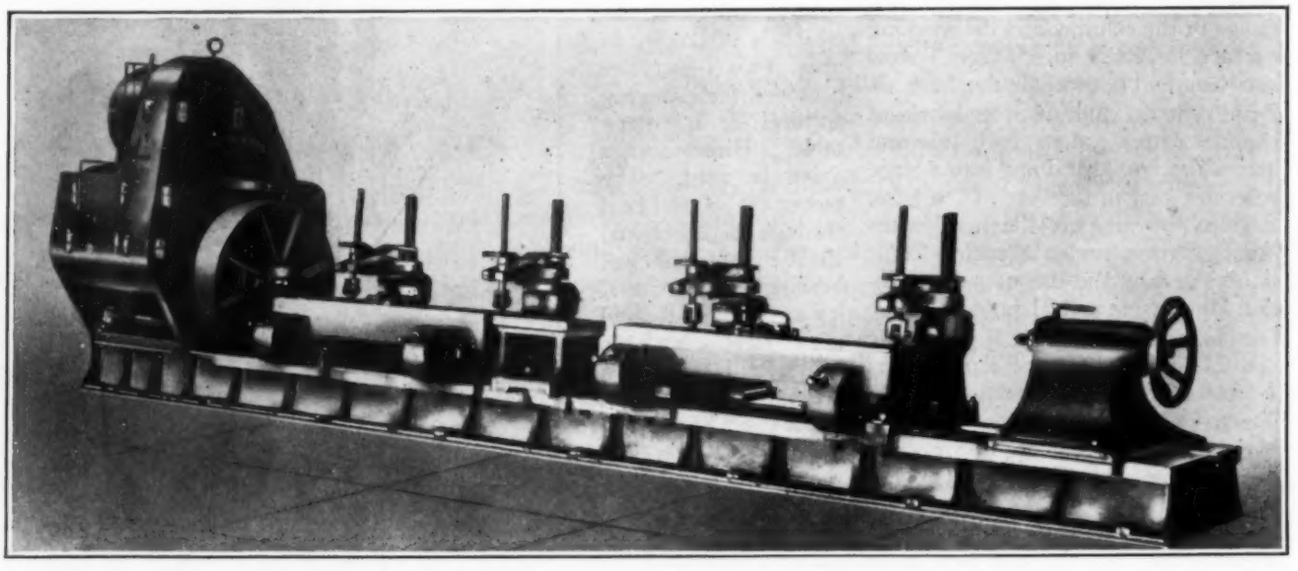


Fig. 2—Mackintosh-Hemphill 31-Inch Motor-Driven Roll Lathe, Roller Bearing Equipped

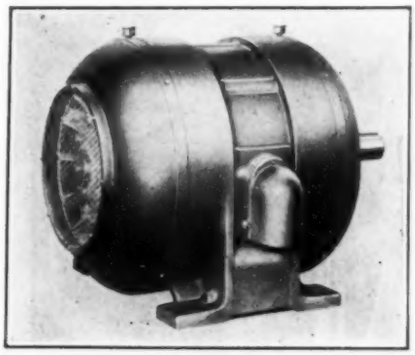


Fig. 1 — Allis-Chalmers Type ARZ Totally-Inclosed Fan-Cooled Motor

rotation in either direction. The back of the laminæ is fully exposed to the blast of cooling air. The discharge openings are easily cleaned.

As shown in Fig. 2, the tubes of the grease cups carry the lubricant into the bearings which are dustproof and grease packed. The internal parts of the motor are easily accessible by removal of the bearing housings. The housings are cast

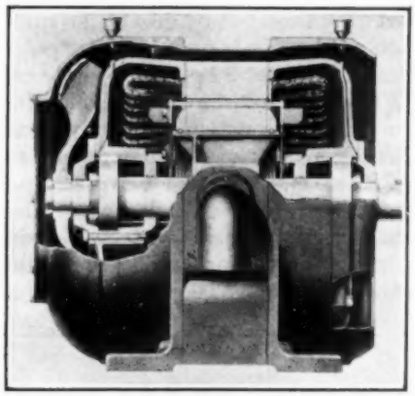


Fig. 2 — Sectional view showing the inner casing and bearing construction

solid and attached to the stator frame with a machine fit so as to completely inclose all the active parts. The motors are rated for a 55-deg. temperature rise. They are built on the same frames as the standard open-type motors of the same ratings, and in practically all cases the foot heights and shaft extensions are the same as for the open-frame motors.

"Cromovan" Die Steel

Resistance to machining in the annealed state has been reduced in this high-carbon, high-chromium alloy developed by the Firth-Sterling Steel Company, McKeesport, Pa. According to the manufacturer, this has been brought about without sacrificing the ultimate hardness after final heat-treatment.

Annealed "Cromovan" has a maximum hardness of 210 Brinell, 35 Scleroscope (Shore Model C), 97 Rockwell B, or 23 Rockwell C. Extreme hardness is produced whether quenched in air, oil, or water. It is claimed that these two characteristics permit low die cost and high production.

Noble & Westbrook No. 4 Marking Machine

TRADE-MARKS, names, letters and numbers up to 4½ in. in length can be marked with this No. 4 machine on flat or round metal parts of various sizes and shapes. Slides can be provided to carry dies for making marks up to 6 in. in length. The machine has been developed by the Noble & Westbrook Manufacturing Company, 20 Westbrook St., East Hartford, Conn. As in the previous No. 3 model, which this machine replaces, the parts are held in a fixture fastened to the table. Greater ease of operation and greater capacity than found in the No. 3 model are features of this design.

It will be noted from the illustration that this machine has no projecting parts to hamper the operator. Hence he is permitted to stand or sit directly in front of the machine while feeding pieces at a fast rate. In addition, the impression and the die are always easily observed.

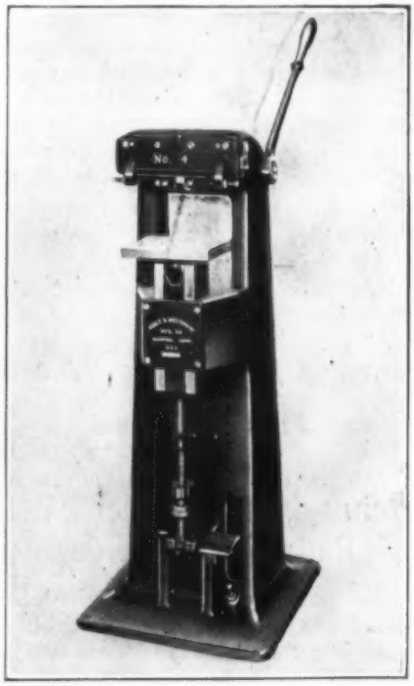
Uniform Marking Possible

Symmetrical appearance of the frame is the result of the strong box section used. As stated above, the work is carried in a fixture attached to the table. To press the part up against the roll die, it is necessary to depress the treadle at the lower right. This treadle raises the table through the short required movement by means of a compound lever system. Little effort is required for this action, even for a deep impression. Furthermore, the handwheel placed on the elevating screw and graduated in thousandths is used to regulate the height of the table stroke so that impressions of uniform depth may be obtained.

The slide is built extra heavy, and is fitted with roller bearings. Stops to control the length of the stroke are mounted at the front of the machine, and these are easily adjusted. Movement of the slide is secured through heat-treated steel gears actuated by the long lever at the top of the machine. The lever can be set in any position convenient to the operator. The maximum distance between slide and table is 8½ in. without the die in place, and 6½ in. under a round die.

A roll dieholder, not shown, is supplied as a separate unit. It is inserted in the dovetail slot just above the table. Movement of the dieholder in or out is secured by the use of an adjusting screw, so that the part fixture on the table need not be moved. The die is returned to the starting position by a spring integral with the holder. Replaceable bronze bushings and a hardened spindle are other features.

The machine can be fitted with a flat die for marking on round surfaces. Both round and flat marking



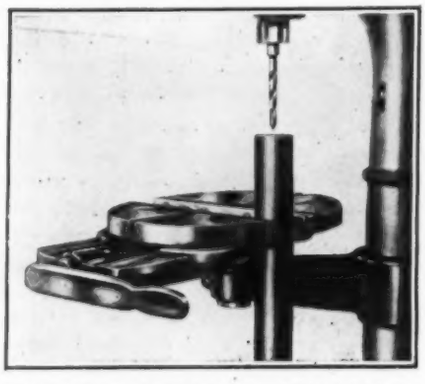
Noble & Westbrook No. 4 Marking Machine

dies can be furnished, fitted in part with changeable steel type, or a holder may be furnished especially to take changeable steel type, this being of advantage where several small lots with different markings are run.

The floor space required is 20 x 20 in., and the weight is 425 pounds.

"Modern" 8- and 28-Inch Sizes of the Combination Drill Table and Vise

Two additional sizes of the combination drill table and vise have been developed by the Modern Machine Tool Company, Jackson, Michigan. These are the 8- and 28-in. sizes, weighing 27 and 600 lb., respectively.

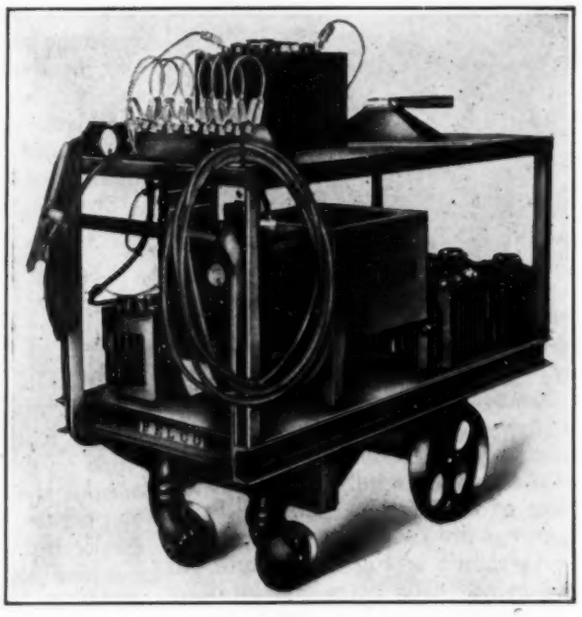


"Modern" Combination Drill Table and Vise

The 19-in. size was described on page 203, Vol. 58, of *American Machinist*. All models embody the same design. The 8-in. drill table is used with electric drills and small radial drills, while the 28-in. vise is built primarily for railroad repair shops. The small size is 8 in. in diameter, and the jaws open to 4¼ in. The table, when open, measures 8x12¼ in. The 28-in. size is 27½ in. in diam. closed, and the jaws open 12 in. The table, when open, measures 27½x39⅛ in. The jaws are 3 in. thick.

Pennsylvania Model BW1 Battery Arc Welder

No power circuit is required by the battery arc welder which has been introduced by the Pennsylvania Engineering Laboratories Company, 5222 Penn Ave., Pittsburgh, Pa. The welder consists of a portable arc-controller, charger and batteries, mounted on the lower deck of a durable truck. An upper deck is provided so that, when the portable welder is not in use as a repair tool, it may be used for recharging automobile storage batteries. It is built for machine shops, factories and car shops. In cases where it is impossible to use the truck shown, the units may be disconnected and carried to the job. According to the manufacturer, the arc is easy to start and easy to maintain, with a current range of six different steps controlled by a switch on the battery arc-controller. The current limit is about 250 amp., and welding wire from $\frac{1}{32}$ to $\frac{5}{32}$ in. can be used. Higher current ranges are obtainable by special design. Close control of the arc is a feature, with no ballast resistance used in the circuit. The capacity is dependent on the size of the batteries used. The standard outfit has sufficient capacity to weld one 12-in. I-beam, including reinforcing, on one charge. It comes complete with leads, electrode holder, wire brush, handshield, and sample welding wire. Weight, 1,500 pounds.

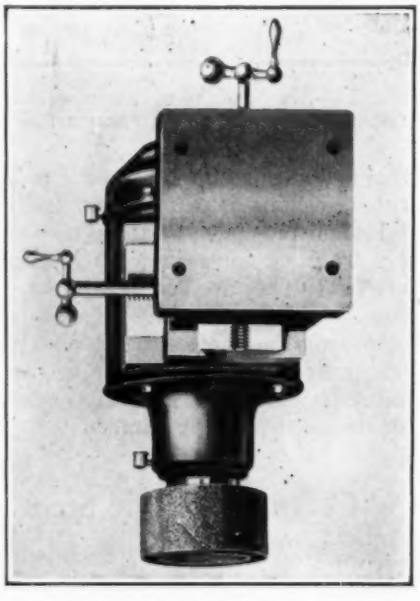


Pennsylvania Model BW1 Battery Arc Welder

Hisey-Wolf Vertical Spindle Grinders

For thrust grinding with the spindle in the horizontal position or with the grinding wheel swung down at any angle, these vertical spindle grinders have been developed by the Hisey-Wolf Machine Company, Cincinnati, Ohio. These grinders can be furnished with a single horizontal slide adjustment, a single vertical slide adjustment, or a combination of the two. A grinder with the double slide adjustment is shown in the illustration.

The bearings are constantly lubricated in an oil bath, and fully inclosed in leakproof chambers. When used in connection with a boring mill, many internal and surface grinding jobs can be done. Although affording tool room accuracy, according to the manufacturer these grinders are sturdily constructed throughout to meet the demands of general production work. They are built in capacities of 1, 2 and 5 hp., and operate on 220- or 440-volt, three-phase, a.c. circuits. The first two sizes operate at 3,500 r.p.m. and the last runs at 1,750 r.p.m. The first two sizes use 7x1-in. grinding wheels, while the last uses a 12x1½-in. wheel. Models for d.c. circuits are available to run at 2,800 r.p.m. They use a 7x1-in.



Hisey-Wolf Vertical Spindle Grinder having double slide adjustments

wheel, and take 3 hp. The weights of the a.c. models are 110, 140 and 280 lb., and the weight of the d.c. model is 290 pounds.

Cleveland Totally-Inclosed Fan-Cooled Motor

A double shell surrounds this motor which has been introduced by the Cleveland Electric Motor Company, Cleveland, Ohio. The inner shell contains the entire motor as

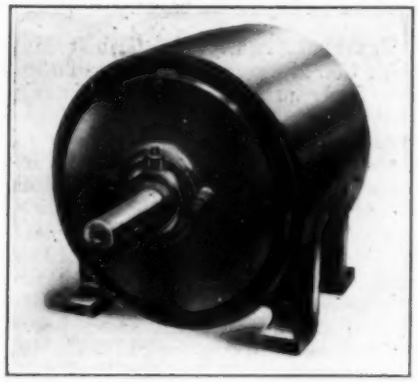


Fig. 1—Sectional view of the Cleveland Totally-inclosed Fan-cooled Motor

shown in Fig. 1. Special packing of the bearings makes it entirely dustproof.

Air is sucked into the space between the two shells by means of a fan mounted between the end walls and upon the shaft. The air is blown over the surface of the inner shell and out at the other end. The openings of the air intake are plainly shown in

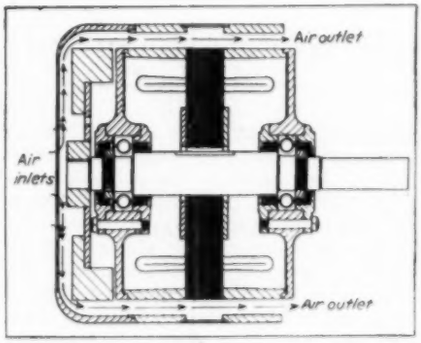


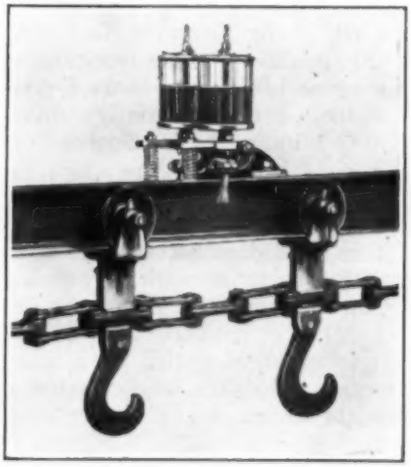
Fig. 2—View showing the air outlet on the Cleveland Totally-inclosed Fan-cooled Motor

Fig. 1. It is claimed that this type of motor permits practically the same rating for a given frame size as an open-type motor.

Saginaw Automatic Conveyor Lubricator

Effective lubrication of conveyor wheels applied to drying systems, washing machinery, enameling ovens, and core ovens, is provided by the use of this automatic conveyor lubricator which has been developed by the Saginaw Stamping and Tool Company, Saginaw, Mich. On the open-type conveyor it is merely a matter of lubrication, whereas on the oven conveyors, the cooling of the bearing must be taken into consideration, as well as the lubrication. On the ordinary conveyor, the lubricator may be placed anywhere on the conveyor line, whereas on oven conveyors, the lubricator should be placed at a point where the trolley leaves the oven, and where it performs the double duty of automatically cooling and lubricating the wheels. On conveyors over 5,000 ft. in length, two lubricators, one at each end of the conveyor are recommended by the manufacturer.

The device consists of a sight-feed lubricator and a wiper brush which contacts with an oil spout on the conveyor wheel. The brush is kept in the proper position by means of a spring shown. Oil drops down through an orifice in the sight-feed lubricator and enters a hollow bushing, directly over the brush. The oil-laden brush delivers oil to the bearing by the wiping contact against an oil spout. Oil

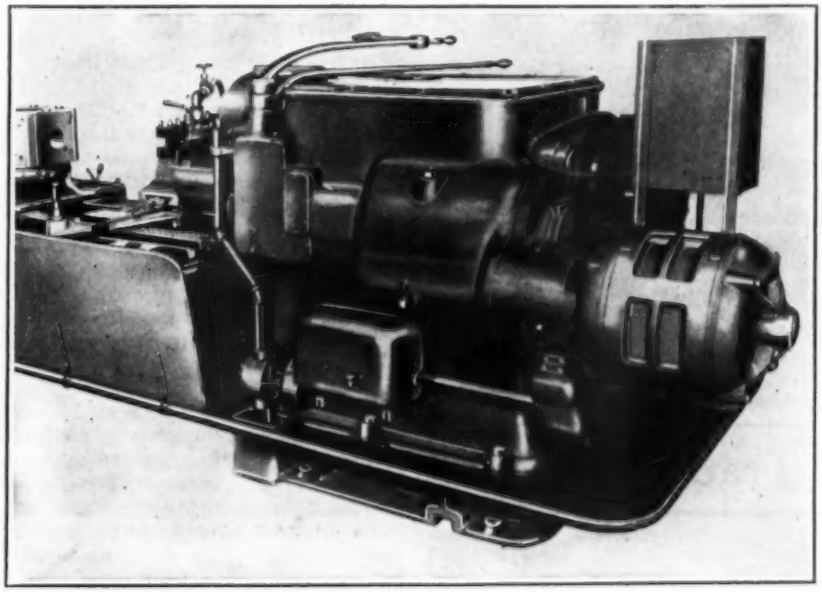


Saginaw Automatic Conveyor Lubricator shown in use

runs down through the spout and into a well surrounding the ball bearings of the wheel. A highly filtered paraffine oil is recommended, and ball and roller bearing wheels, as well as dustproof wheels may be used.

Motor Drive for International Types H and CH Turret Lathes

For application to its types H and CH turret lathes, this motor drive has been introduced by the International Machine Tool Company, Indianapolis, Indiana. The type H lathe was described on page 711, Vol. 67, and the type CH on page 989,



Motor Drive for International Types H and CH Turret Lathes

Vol. 68, of the *American Machinist*. A 20- or 25-hp. drum-type motor running at 1,800 r.p.m. is used, and is connected to the primary drive shaft by means of a flexible-type coupling. A bracket is provided on the machine for the attachment of the special ring end frame of the motor.

This drive does not obstruct light from getting to the work, and allows a clear view over the machine. Although it does not make such a compact arrangement as that above, customers may obtain a bracket to use a standard motor.

"Superior" Model Electric "Sprayit"

This "Superior" model rotary compressor type spraying device has been introduced by the Electric Sprayit Company, South Bend, Indiana. The device is designed for the application of paints, enamels, varnishes, lacquers, and shellac, where a fine finish is necessary. Air is supplied to the nozzle from the self-contained, direct-connected rotary compressor, the rotor of which is mounted on the armature shaft of the motor. This three-bladed rotor is self-lubricated. The pressure developed is stepped up in the specially designed fluid tip and nozzle, to a point sufficient to handle practically any type of spraying material.

"Superior" Model Electric "Sprayit"

Trade Catalogs

ARC-WELDED CRANE. The Cleveland Crane and Engineering Co., Wickliffe, Ohio, has published catalog No. C-100, entitled, "The Cleveland Arc-Welded Roller Bearing Crane," which describes the constructional features of overhead traveling cranes in which arc welding is used in place of riveting. Roller bearings are used throughout. Many photographs of the details and assemblies of this crane are given, together with photographs of the applications. In addition, tram rail systems are shown. The catalog contains fifteen 10½x8-in. pages.

CARBON IN STEEL WELDING RODS. The Fusion Welding Corporation, 103rd St. & Torrence Ave., Chicago, Ill., has published bulletin No. 128, entitled "The Influence of Carbon in Steel Welding Rods." This is the first of a series of bulletins to be published for the purpose of giving interested persons a better understanding of several of the obscure phases of welding. Several products of the company are also shown.

DRILL JIG BUSHINGS. The Ex-Cell-O Tool & Manufacturing Co., Detroit, Mich., has published catalog B-28, showing a line of standardized drill jig bushings made of tool steel. The catalog consists of tabulated data sheets showing more than 2,500 sizes of plain and slip renewable bushings, liners, and headless and head press-fit bushings. Dimensions of each type corresponding to the body thickness are given, together with the dimension drawing. The limits to which the liners and the press-fit bushings are ground are also given, and bushings over 2-in. drill sizes are also included. This catalog, which is attractively printed and pleasingly arranged, contains 47 10½x8-in. pages.

HOISTS. The Union Manufacturing Co., New Britain, Conn., has published a catalog showing a line of hoists. The Union "Red Roller Bearing Hoist" of the spur-geared type has all features shown by a phantom view. These hoists are made in capacities from 1 to 20 tons. Included are the "Acme" quick-acting hoist and the "Differential" hoist. Each of these three hoists has all of the parts shown by means of photographs which provide a means for easy selection of replacement parts. Roller bearing trolleys are also listed. The catalog contains twelve 11x8½-in. pages.

MATERIAL HANDLING EQUIPMENT. The Saginaw Stamping and Tool Co., Saginaw, Mich., has published a general catalog entitled "Saginaw Products." The equipment shown includes standard and dustproof conveyor wheels, ball bearing and roller bearing equipped, steel trolleys, idler trolleys, four-wheel trolleys, chain hoist trolleys, standard roller turns, an automatic conveyor lubricator, a conveyor for drying ovens, and several types of roller-bearing and ball-bearing pressed-steel casters. Trucks of many types are included. Each item is illustrated by means of photographs. Specifications and dimensions are given. The catalog contains 36 10½x8-in. pages.

RESISTANCE THERMOMETERS. The Brown Instrument Co., Philadelphia, Pa., has published Catalog No. 93, showing resistance thermometers for measuring temperatures from —300 to +1000 deg. F. These thermometers are of the indicating, recording and controlling types. Each type of instrument is illustrated. In addition, many installations of these resistance thermometers are shown. Many suggestions for their use are given. The catalog contains 54 10½x 8-in. pages.

TURRET LATHES. The Gisholt Machine Co., Madison, Wis., has published two finely printed catalogs. Catalog H.P.1 shows the 1L and 2L high-production turret lathes. Features of the construction are explained in sequence, and are illustrated by means of photographs. A specification sheet and photographs thoroughly explain the parts of these machines. Floor plans of either size are given. Standard tool equipment for each size are shown. Catalog H.D.L.1 shows heavy duty turret lathes in the 3L, 3AL, 4L, and 5L sizes. Every detail of construction is described. Photographs of various parts and assemblies are profusely used. Tools and accessories are also shown.

UNIVERSAL GRINDER. The Thompson Grinder Co., Springfield, Ohio, has published Bulletin No. 18, illustrating and describing its 12x36-in. universal grinding machine. All of the standard and special features and attachments are illustrated and described. The erection plans of the countershaft type and of the motor-driven type are given. The bulletin contains twelve 11x8½-in. pages.

Pamphlets Received

BUSINESS STATISTICS. The Department of Commerce, Bureau of the Census, has published a pamphlet entitled "How to Use Current Business Statistics," prepared by Mortimer B. Lane, editor, *Survey of Current Business*. According to the author, the practical application of current statistical information by American business men has been one of the outstanding factors in our generally sustained prosperity during the last five years. This pamphlet is devoted to the meaning of statistical terms, with examples of their interpretation taken from the experience of business firms. Copies may be obtained from the U. S. Government Printing Office, Washington, for 15 cents.

NEWS OF THE WEEK

Extent of Simplification of Commercial Forms to Be Investigated

A survey among members of the National Association of Purchasing Agents to determine the degree of adherence accorded simplification of commercial forms, and what per cent of invoice forms now in use conform with the simplified arrangement has been instituted by Ray M. Hudson, assistant director, in charge of the Commercial Standards Group of the Bureau of Standards.

Recently S. L. Whitestone, comptroller for the General Electric Co., reported that a special survey covering a period ranging from 1 to 10 days at the various plants of the company showed that approximately 19 per cent of the invoices received by them were on the simplified form. Also C. M. Finney, comptroller for the Westinghouse Electric and Manufacturing Co., reported that 26 per cent of all invoices received by this company are on the simplified invoice form.

The Machinery Builders Society, New York City, has informed the Division of Simplified Practice that 52 per cent of the membership of the society now use the simplified invoice, and that 28 per cent expect to use it eventually, i.e., when present stocks are exhausted. Only 3 per cent stated they did not use the simplified form.

Fewer Motor Vehicles Made in 1927 Than in 1925

The Department of Commerce announces that, according to data collected at the biennial census of manufactures taken in 1928, the establishments engaged primarily in the manufacture of motor vehicles in 1927 produced, during that year, 2,873,380 passenger vehicles valued on wholesale factory prices at $2,174,718,977; 8,944 public conveyances, valued at $27,836,038; 1,430 government vehicles, valued at $10,781,178; 452,051 commercial vehicles, valued at $324,575,999; and 18,893 trailers, valued at $6,690,238; together with other products valued at $301,610,222; making a total of $2,846,212,652. The output of motor vehicles of all classes in 1927 aggregated 3,335,805 in number and $2,537,912,192 in value. These aggregates represent decreases of 19.9 per cent in number and 13.9 per cent in value as compared with 1925, the last preceding census year.

The proportion of closed passenger cars increased from 21.6 per cent in 1921 to 35 per cent in 1923, 58.3 per cent in 1925, and 85.5 per cent in 1927. The number of this class of motor vehicles manufactured reached a total of 2,408,148 in 1927, compared with 2,080,697 in 1925; 1,201,577 in 1923, and 304,220 in 1921.

Of the 262 establishments reporting for 1927, 44 were located in Michigan, 34 in Ohio, 25 in Illinois, 22 in California, 20 in New York, 19 in Indiana, 14 each in Pennsylvania and Wisconsin, 8 each in Missouri and New Jersey, 6 in Massachusetts, 5 in Texas, 4 each in Iowa, Louisiana, and Minnesota, 3 each in Kansas, Nebraska, and Washington, 2 each in Colorado, Connecticut, Kentucky, Maine, North Carolina, and Tennessee, and 1 each in Delaware, District of Columbia, Florida, Georgia, Maryland, Mississippi, New Hampshire, Oregon, Oklahoma, and Virginia. The decrease in number of establishments from 297 in 1925 to 262 in 1927 is the net result of a loss of 55 establishments and a gain of 20.

Society of Industrial Engineers to Meet in Rochester

The fifteenth annual convention of the Society of Industrial Engineers will be held in Rochester, N. Y., October 17-19, in conjunction with the Industrial Management Council of the Rochester Chamber of Commerce. Meetings will be held in the rooms of the Chamber of Commerce and at the Hotel Seneca. The general theme of the convention will be "Profitable Prosperity—A Practical Program for Cutting Costs and Raising Profits." The complete program of the meeting may be obtained from George C. Dent, executive secretary of the Society, 205 Wacker Drive, Chicago.

Leather Belt Standards Proposed by A.S.M.E.

Because leather belting valued at about $30,000,000 is being purchased each year without accurate knowledge of its suitability for specific conditions of use, wearing qualities in service, or proper methods of maintenance, the American Society of Mechanical Engineers has asked the American Engineering Standards Committee to authorize the establishment of definite standards for leather belting as a guide to industrial purchasers.

This proposal is now being considered by the executive committee of the Standards Committee. If approved, the work will be undertaken shortly, covering, as requested by the Society: (1) Quality (standard material specification); (2) capacity (horsepower rating); (3) weight (dimensions, thickness and weight), and (4) care and maintenance of belting.

Precedent for belting standardization is found in the work of the American Petroleum Institute which has established standards for all types of belting used in the oil industry. The Institute estimates that its specifications and recommendations for care and usage increase the service value of belting purchases by 25 per cent.

Farm Machinery Exports to Canada Break Records

Exports of agricultural implements from the United States in the first half of 1928 were larger than in any previous six months' period, and were characterized by shipments to Canada which had never before been equaled for any similar period, according to the Agricultural Implements Division, Department of Commerce.

Total shipments of implements to Canada during the period under discussion amounted to $23,418,598, which was 43 per cent of the shipments to all countries. It was an increase of 73 per cent over the exports to Canada during the first half of 1927, and exceeded Canadian purchases of American implements for any preceding 12-month period with the exception of the year 1927.

More than half of the shipments to Canada during the first six months of 1928 consisted of tractors and parts. Harvesters and binders played only a small part in the total of Canadian purchases.

Argentina was the second largest buyer of American implements, as in the first half of 1927. Shipments to Argentina also increased, but not to an extent sufficient to indicate any important changes in the market. Russia and Australia ranked third and fourth respectively as purchasers of American implements.

Aeronautical Exposition

Plans are announced for an International Aeronautical Exposition to be held in the Chicago Coliseum, December 1-9, 1928. The show is being conducted by the Aeronautical Chamber of Commerce of America, Inc., in conjunction with the Chicago Aero Commission and a committee of Chicago business men.

The Business Barometer

The outlook in Commerce, Finance, Agriculture and Industry

By THEODORE H. PRICE

Editor, Commerce and Finance, New York

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MONEY is not only occupying the most prominent place in the picture of business, both present and future, but it promises to constitute a politico-economic issue of the first order if crop-moving and other commercial funds shall be scarce and dear during the autumn. The clouds of criticism have been gathering around the policies of the Federal Reserve System throughout the later stages of its campaign to deflate security market loans, and they promise to become stormier as the autumnal demand for credit mounts to its peak around the middle of October. Indeed it is not impossible that those who are raising the cry of the "Second Deflation" (1919-20 being the first) will force the issue into the Presidential campaign despite the sincere wish of all informed business men that the Federal Reserve System may be kept free from partisan politics.

It is plain that the Reserve authorities are in a dilemma which is not to be envied. They have discovered that through our banking system inflation can develop with comparative ease but deflation can be achieved only with extreme difficulty. If the Reserve Banks take steps to make money easier in the autumn for the benefit of agriculture and business, they run the risk of having the stock market attract all the benefits to itself by bidding higher for the additional supplies of credit than business can afford to. And if the Banks do not take steps to make money easier it is highly probable that the active business the country is now enjoying and will continue to enjoy through the autumn, unless all signs fail, will be checked sometime during the winter by the restraint to enterprise which is the inescapable effect of high-priced capital.

Certainly the Reserve authorities do not wish to penalize business. On the other hand they may decide that an effort to aid business would merely succeed in stimulating stock market speculation to the point of distension and collapse, with eventual effects on business that would be as depressing as firm money now.

The only certainty in the situation is that there is no hope of cheaper business money unless the Reserve Banks supply the markets with much additional credit through the purchase of government securities which will increase the reserves and lending power of their member banks. As to whether they will do this the sharpest division of opinion exists. The economists of two leading banks in the past week have expressed opposite views of the prospect, one expecting enforced stock market liquidation through Reserve Bank passivity and dearer money, and the other counting on a revival of the stock market boom through Reserve Bank credit.

If I were compelled to express an opinion I could not take either side with much assurance, but it seems most likely that the Reserve authorities will find it difficult to formulate or adhere to a consistent policy, but will meet the situation from week to week as it develops. For the present they seem disposed to let events take their course without further interference. When the "miracle" of 4½ per cent call money reappeared in Wall Street last week it was accompanied by reports that the Banks had reversed their policy and were buying government securities, but the weekly statement issued on Thursday revealed instead a slight decline in their holdings and a drop of almost $60,000,000 in rediscounts. As usual the bulk of stock market funds comes from the much-discussed loans by "all others" to brokers, which were virtually unchanged last week although there was a drop of $50,000,000 in loans to brokers by banks. Under present credit conditions the low rates that were established last week will of course be evanescent. As long as the Reserve Banks continue passive, or supply no more additional credit than crop moving absolutely necessitates, money will continue dear and business has no alternative but to resign itself to the prospect.

This situation is dealt with at length because nothing else in the business complex approaches it in importance. Present money rates should not materially interfere with distributive trade and commerce, which they merely make a little more costly to conduct, but in the long run the restriction on equipment purchases and construction which they impose, and which is already evident in the smallness of new bond issues during the past six weeks, will necessarily extend back through many trades until the business of the whole country is more or less affected.

But it would be premature to take this possibility too much into consideration at present. The industrial machinery of the nation is revolving with such momentum that it can be expected to carry on for a long time yet. Building, automobiles, and iron and steel are all busy on a level substantially above the average for the season, and in some instances are making new high records. Electrical consumption by manufacturing establishments, which is a key to their activity, was 10 per cent higher in July than in the same month last year. Therefore, although some industries, of which cotton textiles is the most notable, continue to lag, employment in manufacturing centers on the whole is high and there can be no complaint of their purchasing power.

WHAT'S DOING IN INDUSTRY

IN ALL parts of the country, conditions in the machine tool market are much better than during the same period last year, and in more than one instance are as good as for any other period this year. In Canada general industrial conditions were never better and employment is the highest in some time. There the iron and steel industry is very favorable and, as in the United States, the aeronautical industry is beginning to line up as an important factor in the machine tool market.

DETROIT also reports general business prosperity and the highest employment figures ever reached, but purchases of metal-working equipment have been slow for some weeks. New York finds a temporary lull for the first time this summer due to the interference of vacations; however, prospects for early fall activity are extremely bright. Little railroad buying is reported there or in the South, but Chicago reports a steady demand for standard machine tools from most of the prominent roads. Sales of equipment to general buyers are well above average for the season, with agricultural implement and tractor manufacturers the chief purchasers.

WOODWORKING machinery is one of the most active lines in the South, which is going through a period of dullness in other lines. The outlook for future business is promising, however. In New England, sales of machine tools, particularly small machines, are well above the average, and an active fall is anticipated. An upward swing is also seen in the Cincinnati district, where astonishment is expressed at the way the trade has held up during the vacation season.

The Industrial Review

Weekly progress of the machinery and machine tool business

THE following reports, gathered from the various machinery and machine tool centers of the country, indicate the trend of business in these industries and what may be expected from the future:

NEW ENGLAND

There is a gratifying steadiness to business in the New England machine tool field, which points to a favorable future. The market from week to week shows no pronounced fluctuations, an exceptional feature during the summer months. Inquiries, according to representative manufacturers and dealers, are promising. The sales volume, especially for the smaller machine units, is and should continue to be above the mid-summer average.

Indications are strongly favorable to an active fall period. Industrial construction would anticipate an unusual expansion, reflecting in machinery sales to the aeronautical, automobile, electrical and the machinery manufacturing industries. This promise was upheld in new inquiries noted during the current week. Dealers in used and rebuilt machinery report a good volume of sales. Presses, grinding and cutting equipment, small lathes, drills and automatic units find a ready market in most New England sections.

School buying is still active. Railroad buying is quiet with current rumors, however, that there will be more business from this source in the fall. The Goss & DeLeeuw Machine Co., New Britain, Conn., is to build an addition, 100x175 ft., to be equipped with special machinery for making multiple spindle automatic chucking machines. It is expected the new unit will be ready for operation in November.

NEW YORK

For the first time this summer a noticeable letup in machine tool activity is noted, but no fear is felt for the future as it is obvious that the cause is vacations. Not only shop superintendents and others that buy and specify equipment, but also machine tool salesmen themselves are taking advantage of the hot weather and letting business for the moment take care of itself. Every dealer and factory representative reports a number of active prospects, and many predict that August sales will be up to normal due to business placed earlier in the month. As a result the third quarter, now that it is half over, is looked to as the best this year, what with the excellent sales volume obtained in July and September prospects.

Railroad buying has been dull for some time, although the New York Central R.R. bought a few tools in the past week, including two turret lathes. The Baltimore & Ohio R.R. has an inquiry out for a large engine lathe and an axle turning lathe.

General buying is coming from unexpected sources in many instances. For example, radio station WEAF bought a milling machine for experimental work and Fox Films, Inc., purchased about ten machines.

Among the machines sold by the Triplex Machine Tool Co. in the past week were: One 18-in. x 8-ft. lathe to a Brooklyn firm, one Mikron gear hobber to a large electric company, two Triplex combination machines, two Ames bench lathes to a Jersey firm, one Edlund 3-spindle and one 2-spindle drill, and a filing machine. The Triplex company predicts a good month.

Among the machines sold by the Pratt & Whitney Co. in the past fortnight were: One No. 1A and one No. 2 jig borer to firms in the East, three No. 2 jig borers to companies in the West, one 4½x12- and one 6x60-in. thread miller, one No. 3 die sinker, two multiple-spindle drills, eleven lathes ranging in size from 13x30 to 20x72 in., and one 9½-ft. deep hole drill. The Niles Tool Works Co. sold two 6-ft. Right Line radial drills, and a 48-in. carwheel borer. The machinery division of the company sold a 4-ft. Morris radial drill, a 12-in. H. & R. metal-cutting saw, seventeen Ransome grinders, a Cincinnati high-speed taper, a 16-in. Simplex shaper, a Morris 18-in. x 8-ft. lathe, a Canton No. 2 portable floor crane, and a Bradley 100-lb. strap hammer. Prospects for the fall are very bright.

SOUTHERN DISTRICT

The past two weeks has witnessed little change in the machinery or machine tool situation in the Southern district, dealers still reporting the usual summer lull in evidence, but the outlook promising for an improvement in sales during the early part of September, and a fairly good volume of business during the fall months.

Distributors of woodworking machinery are still doing a good volume of business in the Southeast, with the furniture industries in the Carolina, Georgia and East Tennessee territory the most active buyers, the millwork and sawmill industries all over the South a fair buyer, and business only a little below normal with other branches of the woodworking industry. The outlook is for continued brisk demand the rest of the year, making 1928 a better than normal year for this line.

On the other hand, very few orders are being reported from either the smaller machine shops or the garages or service stations, a situation that has prevailed ever since the first of the year, with nearly all of the orders reported being for used or rebuilt machinery.

The textile industry is a fair buyer of equipment, as it has been for some months, placing orders largely for new equipment to be used in the various new textile mills being constructed in the South this summer. There is little doubt but that 1928 will be a better year than dealers had looked for so far as sales to textile mills are concerned.

Railroads are placing a few orders for heavy equipment for shop projects. Some orders are also reported for road-building machinery, and demand for contractors' equipment continues fairly brisk due to the large amount of new construction in progress in the Southeast.

DETROIT

In spite of the summer depression that has existed here for several weeks there is a very definite feeling of optimism throughout the machinery and machine tool trade in the Detroit area. Few inquiries of any great importance are being received and all of the month of August has been decidedly slow. There has been some good replacement business and a great deal of balancing up. The vacation season has cut in deeply, however, and it is not expected that things will improve much before the middle of September.

In spite of this lull, it is apparent that Detroit is going through one of the most prosperous periods in its history from many standpoints. All of the automobile plants are going at top speed and employment is higher now than it has ever been, even at the greatest peak. There are now many thousands more men employed here than ever before at this time of the year, or in fact at any time, and there has been a constant increase, without a break, since January, for the first time in the city's history.

Right now Buick, Chrysler and Studebaker are expected to come into the market fairly soon for large amounts of equipment, judging by the demand for cars and the general condition of business. The new Buick line is going very well and there will probably be a good deal of tooling up necessary for production.

Rumors are current in Lansing that W. C. Durant is contemplating new moves in the automotive industry but thus far there is nothing definite. The new $750,000 plant is nearing completion.

The Dodge-Chrysler, the Studebaker and other smaller mergers have aroused a great deal of interest and a great deal of speculation is being indulged in. There is much talk of further amalgamations, especially in view of the situation caused by the withdrawal of Raskob and DuPont from General Motors. Whether these rumors are based on anything substantial and whether the machinery business would be materially affected by the new alignments is still entirely problematical.

CINCINNATI

Machine tool manufacturers in the Cincinnati district express satisfaction with the volume of business done during the past week. In fact, there is a general feeling of astonishment that trade held up so well in the midst of the vacation season. Among the reports made there was no sign of pessimism as to the future, but to the contrary the great majority of the manufacturers are of the opinion that the trade pendulum is on its upward swing. A typical statement is that "business is holding up remarkably well for the season, and we have done considerably better than to hold our own."

Selling agents report that their sales were at a fairly good level the past week, and the forecast of this branch of the trade is that a much better demand is about to develop in local and adjacent territory.

While an increased percentage of the orders received in the past week called for two or three tools, the backbone of the market still was the sale of single tools. The week's orders came from all sections of the country and were well diversified, the principal buyers being general machinists and miscellaneous users.

The majority of the manufacturers and also the majority of the selling agents report that inquiries came in very freely during the week, the greater portion being from general machinists and miscellaneous users, located in all sections of the country, whose requirements were mainly single tools. Scattering inquiries for single tools were received from railroads and concerns in the automotive and allied industries.

Production is at a very good level for the season and it is thought that manufacturing activity will increase in a short time.

CHICAGO

Mid-August finds the machine tool industry in better shape than for a like period in several years, according to all reports. Selling is being well maintained, and inquiries looking to future prospective business are being received in good volume. While no major development has been reported in railroad buying, there prevails

a steady demand for a number of standard tools, inquiries or scattering orders coming from most of the western roads, including the Rock Island, Burlington, Santa Fe, North Western and St. Paul.

Farm implement and tractor builders still are adding to their lists, it being understood that there has been a general replacing of old machines by those of the newest and most efficient type. Among other active factors in the market, the A. O. Smith Corporation, of Milwaukee, is prominent, having added to its already large list a number of new items of shop equipment.

Demand for used tools is inactive, but the inquiries being received indicate that, following the vacation season, the call for this class of equipment will largely increase.

CANADA

Third-quarter business in the machinery and machine tool field in Canada is more than measuring up to expectations. General industrial conditions throughout the country were never better, nor prospectively have held out greater assurance of reasonable continuance. There is unusual activity in building and construction, while employment conditions are reported to be at the highest level since 1920.

Reports of the iron and steel industry are equally favorable. Production for the first half of the year was higher than that recorded for any six months period in some years. Furthermore, the usual summer dullness is not so marked this year; in fact many of the large users of iron and steel are exceptionally busy at present. The Steel Co. of Canada has announced a huge expansion program involving an expenditure of six or seven million dollars, to be spread over the next three years. The capacity of the company's plants will be increased and the operating efficiency will be enhanced materially through the carrying out of the plan.

The Dominion Bridge Co. still continues to increase its business. The company recently received a contract to build a bridge over the Saguenay River, in the Province of Quebec, at a cost of approximately $250,000. The Hamilton Bridge Co. is reported to have sufficient orders on hand to keep its plant operating at capacity for probably the next eight or nine months. An order was recently received for 1,400 tons of fabricated steel for the new plant which General Motors is erecting in Regina, Saskatchewan.

The aeronautical industry is lining up as an important factor in the Canadian field. The Canadian Vickers plant at Montreal is reported to be very busy. Considerable attention is being devoted at present to experimental work for the production of purely Canadian types of aircraft and for the redesigning of existing models to meet exacting Canadian requirements.

Car Company Organizes Aircraft Subsidiary

The St. Louis Car Co. has organized the Cardinal Aircraft Co. as a subsidiary for the manufacture of airplanes, thus marking a return by the former to the industry after an absence of ten years. During the war the corporation constructed 450 planes for the government, and a contract for an additional 220 was interrupted by the armistice. The present facilities of the car company will be used for the subsidiary concern.

It is planned to manufacture a plane to compete in the popular-price field, with several special models also contemplated. It is understood that the initial product will be powered with a five-cylinder radial engine giving a cruising speed of 100 miles per hour. Manufacturing tests are now going on, production will start in the near future, and the first plane is expected on the market within ninety days.

Auto Concerns Report Good Earnings

Of the 19 automobile companies that have published financial reports for the initial six months this year, 12 of them report increases in earnings against the corresponding period last year, according to the *Daily Metal Trade*. The rate of production indicated by the report shows that the half-year has been profitable despite keen competition and price cutting. The 12 companies that reported gains are, in the order of their sizes: General Motors, Chrysler, Studebaker, Willys-Overland, Caterpillar Tractor, Hupmobile, Reo, Graham-Paige, White Truck, Brockway, Stutz and Yellow Truck. In the case of the last named company the gain was measured by a reduction in net loss, as compared with 1927.

Hudson and Mack trucks are two of the large production companies which did not fare as well in the first half year as they did in 1927.

Eight out of 11 motor accessory companies reporting for the half year showed an increase in net available for dividends.

The outstanding company was Stewart-Warner.

Fuels Meeting to Discuss Stoker Equipment

The Second National Fuels Meeting will be held in the Cleveland Hotel, Cleveland, Ohio, on September 17 to 20, inclusive, under the auspices of the fuels division of the American Society of Mechanical Engineers.

The registration headquarters will open on the morning of Monday, September 17, 1928, and at 11 o'clock Thomas T. Baker, president of Carnegie Institute of Technology, will deliver the address marking the official opening.

The first technical session will be held Monday afternoon, September 17. A session on fuel characteristics, papers on the constitution and classification of coal and fuel, will be presented.

Sessions on industrial applications of fuels, heat transfer, powdered fuel, and a general session will mark the second days' activities. In the Industrial Session papers dealing with the relative values of solid, liquid and gaseous fuels; industrial furnace efficiency, economic considerations and the use of fuels in tunnel kilns, are scheduled.

Wednesday will be occupied with sessions on refractories and stokers, a session on marine practice, a session on central station methods and progress and a series of papers treating with the fuel problems confronting the railroad men. Developments in recent design of stoker fired equipment, progress in central station use of pulverized coal and the present status of furnace and burner design as affected by the use of pulverized fuel, will be submitted for discussion. Those interested in the railroad angle of the fuel problem will find much of interest in the papers covering railway practices in the utilization and conservation of coal, the selection and use of fuels in locomotive practice, the relative values of different sizes of the same fuel in locomotive service and railway practices in the utilization and conservation of coal. A number of interesting inspections of various Cleveland plants have been arranged, with special manœuvres at the airport for the visitors as the final inspection trip.

Seventh Power Show Announced

The seventh National Exposition of Power and Mechanical Engineering will be held at the Grand Central Palace, New York City, Dec. 3-8, 1928. Equipment exhibits will include power apparatus, heating and ventilating apparatus, machine tools, transmission equipment and a miscellaneous group, including exhibits of safety appliances. The exhibit will take place concurrently with the annual meeting of the American Society of Mechanical Engineers.

Pierce-Arrow to Join Studebaker

Stockholders of the Pierce-Arrow Motor Car Co. have approved plans for a reorganization of the company in which the Studebaker Corporation will have a substantial interest.

Under terms of the plan, Studebaker will invest $2,000,000 in the new company, receiving in return all of the Class B stock to be issued. Although the plans do not provide for a merger, Studebaker's selling organization will be put behind the new company in the expectation that production at the Pierce-Arrow plant will be increased to 15,000 units a year.

Bausch & Lomb Celebrates Its 75th Anniversary

The Bausch & Lomb Optical Co., Rochester, N. Y., is celebrating its 75th anniversary this month. John Jacob Bausch, deceased in 1926, went into partnership with Henry Lomb, deceased in 1908, by borrowing $60 in 1863 and setting up a shop in the gallery of Reynolds Arcade in Rochester. The company was first known as the Vulcanic Optical Instrument Co. as it was using hard rubber in its mountings. Later the firm changed to its present name when it began the manufacture of microscopes in 1875. In 1915, optical glass, heretofore imported, was successfully manufactured after a long series of experiments, so that the company was able to furnish range finders, binoculars and telescopes to the government during the War. Among its present product are a line of precision optical measuring instruments.

Financial Notes

The American Machine & Foundry Co. and subsidiaries report, for the six months ended June 30, a net profit of $486,299, compared with $634,951 for the first half of 1927. Including the company's proportionate interest in the International Cigar Machinery Co., the total net profit amounted to $635,737.

The Victor Talking Machine Co., Camden, N. J., returned a smaller net profit for the end of the second quarter due to an adjustment of $293,353 resulting from the acquisition, during the quarter, of assets of wholesale distributors, which reduced the net. It was an excellent quarter, the net profit totalling $1,270,686 after depreciation, federal taxes and the aforesaid adjustment.

The Caterpillar Tractor Co., including Western Harvester Co., for the quarter ended June 30 showed a profit of $2,811,664 after depreciation but before federal taxes, and for the six months this year profit was $4,292,897 before federal taxes, as compared with $3,382,139 in the first half of 1927.

The Stewart-Warner Speedometer Corporation reports for the first six months of 1928 net profit of $3,613,334 equal to $6.02 a share earned, against $2,570,926, or $4.28 a share in the first half of 1927.

Business Items

The Precision Products Co., Ann Arbor, Mich., has purchased the plant formerly occupied by the Michigan Furniture Co., and will manufacture radio sets.

Kaester & Hecht Co. will be known as the Westinghouse Electric Elevator Co., and will operate as an entirely separate unit of Westinghouse Electric & Manufacturing Co. Headquarters will be in Chicago.

The Cotta Gear Co., Rockford, Ill., has been incorporated with $200,000 capital to manufacture and deal in gears, transmissions, machines and tools by L. P. Cotta, G. F. Colton and C. F. Cotta.

The Lancia interests of Italy are reported to have purchased the old Fiat plant at Poughkeepsie, where they will assemble the Lancia car, beginning in the near future. It is expected that the company will start manufacture here at a slightly later date.

The Dempsey-York Co. has been organized at Statesville, N. C., and is reported contemplating the establishment of a plant to manufacture sheet metal machines, fender rollers, etc. The owners of the company are D. H. York, Statesville, and A. P. Dempsey, 114 S. Catherine St., Baltimore, Maryland.

The Linde Air Products Co. has added four new plants, making a total of 52 oxygen producing plants throughout the country. On July 3 the Harrisburg, Pa., plant began operations, followed by the second at Allentown on July 18, the third on August 1 at Shreveport, La., and the last on August 10 at Charleston, W. Va.

The Prest-O-Lite Co., Inc., recently added two new plants, bringing the total up to 33. The first plant, which started production on July 12, is located at Harrisburg, Pa., while the second commenced operations on July 21 at Allentown, Pa. These plants will serve nearby industry with dissolved acetylene, used in oxy-acetylene welding and cutting.

Articles of incorporation have been issued to the American Tool and Equipment Co., 134 La Salle St., Chicago. The corporation will manufacture and deal in tools, automatic hammers, automatic pumps, and mining machinery. Capital, 1,000 shares of no-par value. The incorporators are: George Lawrence, Frank Frandzel, and Russell Alvarez.

Letters of incorporation have been issued to the Automatic Packing Machine Corporation, Chicago. The company will manufacture and deal in automatic and non-automatic packing and casing machinery. The incorporators are William E. Fisher, Chester W. Culp and Francis E. Hinckley. Capitalization: 1,000 shares no-par value common and $300,000 preferred stock.

The Georgia Blow Pipe Co. recently opened a new plant at 510 First St., Macon, Ga., manufacturing blow pipe equipment, ventilating and heating systems. The company is headed by R. R. West, formerly identified for a number of years with his brother, George West, as one of the owners of the Atlanta Blow Pipe Co., 297 Marietta St., N.W., Atlanta.

Plans were recently announced to consolidate the Republic Iron & Steel Co., Youngstown, Ohio, with Steel & Tubes Inc., of Cleveland, into a company with assets exceeding $157,000,000. This announcement was made jointly by E. T. McCleary and Myron A. Wick, presidents of the respective companies. The consolidation was approved by the Republic company and is subject to the ratification of the stockholders of Steel & Tubes.

The J. I. Case Threshing Machine Co. hereafter will have exclusive right to the Case name. The J. I. Case Plow Works has been changed to the Massey-Harris Co., after operating under the Case name for more than fifty years, and the title has been sold to the Case Threshing Machine Co. The Massey-Harris Co. will become the American Division of Massey-Harris, Ltd., of Toronto, Can., and will have its general office at Racine, Wis.

Obituaries

ROBERT HORSBURGH, vice-president of Horsburgh & Scott Co., of Cleveland, died recently.

ALONZO C. PACKER, 76, pioneer locomotive builder, died recently in Pittsburgh. Mr. Packer invented the Packer locomotive truck and had been connected with the H. K. Porter Co., Pittsburgh, for the past 57 years.

JOHN M. ANDERSON, president of the Albert & J. M. Anderson Manufacturing Co., Boston, died on July 25 in his 73rd year. Many notable achievements in the design and construction of switches and circuit breakers are attributed to him.

Personals

WILLIAM E. GIFFORD is no longer associated with the Gifford Screw Products Co. of Worcester, Mass.

R. F. INGRAM, sales manager, Landis Tool Co., Waynesboro, Pa., returned on August 14 from a European trip.

ALEXANDER C. BROWN, president of the Brown Industrial Hoist Co., Cleveland, has been appointed head of the Republican finance committee for Ohio.

JOHN W. BRAY, sales manager of the Bullard Machine Tool Co., Bridgeport, Conn., with Mrs. Bray, sailed recently for an extensive business trip abroad. Mr. Bray will spend part of his time, from September 5 to 23, at the Olympia Machine Tool Exhibit, London, where several Bullard machine tools are being shown.

CAPT. EMORY S. LAND, construction corps, U.S.N., has been appointed to the office of vice-president of the Daniel Guggenheim Fund for the Promotion of Aeronautics. Captain Land has been released by the Navy Department from his present duties as assistant chief of the Bureau of Aeronautics, for a period of a year.

LEE J. EASTMAN, president and general manager of the Packard Motor Car Co. of New York, distributors, has been elected vice-president of the Packard Motor Car Co., Detroit.

JOHN A. PENTON, chairman of the board of directors of the Penton Publishing Co., has been appointed to the advisory committee of the Department of Manufacture of the United States Chamber of Commerce.

FRED JOHNSON, formerly in charge of the St. Louis sales office of the Wagner Electric Corporation, has been appointed manager of the Los Angeles branch office. This transfer terminates 21 years of service as district manager of the St. Louis territory.

Forthcoming Meetings

Canada's Steel and Power Show. Second annual show to be held at the University of Toronto Arena, Sept. 4-7. Secretary, Campbell Bradshaw, 24 Front St., Toronto, Ontario.

American Railway Tool Foremen's Association. Annual meeting, Hotel Sherman, Chicago, Sept. 12, 13 and 14. G. G. Macina, secretary, 11402 Calumet Ave., Chicago.

American Railway Tool Foreman's Association. Sixteenth annual convention of the Supply Association, Hotel Sherman, Chicago, Sept. 12, 13 and 14. F. A. Armstrong, secretary, the Pratt & Whitney Co., 564 W. Monroe St., Chicago.

Machine Shop Practice Division, American Society of Mechanical Engineers. National meeting, Cincinnati, Sept. 24-26. Part of sessions to be on steamer "Cincinnati." Secretary, Carlos de Zafra, 29 W. 39th St., New York City.

National Safety Council. Seventeenth annual safety congress to be held in New York, October 1-5. W. H. Cameron, managing director, 108 E. Ohio St., Chicago.

American Society for Steel Treating. "National Metals Exposition," Commercial Museum, Philadelphia, Pa., week of Oct. 8. W. H. Eisenman, secretary, 4600 Prospect Ave., Cleveland, Ohio.

American Welding Society. Fall meeting and exposition, Exhibition Hall of Commercial Museum, Philadelphia, Pa., Oct. 8-12, in conjunction with "National Metals Exposition" of the American Society for Steel Treating. Miss M. M. Kelly, secretary, 29 West 39th St., New York City.

Institute of Metals, Division of American Institute of Mining and Metallurgical Engineers. Annual fall meeting during National Metal Week, Oct. 8-12, Benjamin Franklin Hotel, Philadelphia. W. M. Corse, secretary, 810 18th St., N. W., Washington, D. C.

American Gear Manufacturers Association. Semi-annual meeting, Statler Hotel, Buffalo, N. Y., Oct. 11-13. T. W. Owen, secretary, 3608 Euclid Ave., Cleveland, Ohio.

Society of Industrial Engineers. Fifteenth annual convention, Rochester, N. Y., October 17-19, in conjunction with the Industrial Management Council of the Rochester Chamber of Commerce. George C. Dent, executive secretary, 205 Wacker Drive, Chicago.

National Manufacturers' Association. Combined assembly with the National Industrial Council in New York City, October 22-24. George S. Doudinot, secretary, 11 W. 42nd St., New York City.

American Management Association. Autumn convention, Palmer House, Chicago, Nov. 13-15. W. J. Donald, managing director, 20 Vesey St., New York City.

Iron and Steel Division, American Society of Mechanical Engineers. Second national meeting, Chicago, November 14-15. Thomas Wilson, chairman of Chicago local section host, 7 S. Dearborn St., Chicago.

The Weekly Price Guide

Rise and Fall of the Market

DEMAND continues active for pipe, wire products and steel sheets, with prices higher than a week ago for heavy melting scrap, semi-finished material and cold drawn steel. Coke and pig iron hold steadily to quoted levels, although buying in the latter is confined to small lots. Steel mill operations are at 78 per cent of capacity, a gain of 3 per cent over last week's rate. Antimony rose ¼c. per lb. this week at New York warehouses; other non-ferrous metals remaining practically unchanged. Linseed oil dropped 0.4c. per lb., to $0.103, at Chicago.

(*All prices as of Aug.* 17, 1928)

IRON AND STEEL

PIG IRON—Per gross ton, f.o.b.:

CINCINNATI	
No. 2 Southern	$19.69
Northern Basic	20.89
Southern Ohio No. 2	21.19
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	25.62
BIRMINGHAM	
No. 2 Foundry	15.50
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	20.76
Virginia No. 2	27.17
Basic	19.76
CHICAGO	
No. 2 Foundry local (silicon 1.75@2.25)	20.00
No. 2 Foundry, Southern (silicon 2.25@2.75)	22.01
PITTSBURGH, including freight charge ($1.76) from Valley:	
No. 2 Foundry	19.26
Basic	19.26
Bessemer	21.26

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	4 50
Cleveland	5.00
Cincinnati	4.30
New York	5.25
Chicago	4.50@4.75

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the mill base in large lots.

Blue Annealed	Pittsburgh Mill Base	Chicago	Cleveland	New York
No. 10	2.10@2.20	3.35	3.25	3.90*
No. 12	2.15@2.25	3.40	3.30	3.95*
No. 14	2.25@2.35	3.45	3.35	4.00*
No. 16	2.35@2.45	3.55	3.45	4.10*
Black				
Nos. 18 to 20	2.40@2.55	3.60	3.20	4.00
No. 22	2.55@2.70	3.75	3.35	4.15
No. 24	2.60@2.75	3.80	3.40	4.20
No. 26	2.70@2.85	3.90	3.50	4.30
No. 28	2.85@3.00	4.05	3.65	4.45
Galvanized				
No. 10	2.90@3.05	3.95	3.55	4.25
Nos. 12 to 14	3.00@3.15	4.05	3.65	4.35
No. 16	3.10@3.25	4.15	3.75	4.45
No. 18	3.25@3.40	4.30	3.90	4.60
No. 20	3.40@3.55	4.45	4.10	4.75
No. 22	3.45@3.60	4.50	4.15	4.80
No. 24	3.60@3.75	4.65	4.25	4.95
No. 26	3.85@4.00	4.90	4.50	5.20
No. 28	4.10@4.25	5.15	4.75	5.45

*250 to 3,999 lb.

WELDED STEEL PIPE—Warehouse discounts are as follows:

	New York		Cleveland		Chicago	
	Black	Galv.	Black	Galv.	Black	Galv.
1 to 3 in., butt welded	50%	36%	55½%	43½%	54%	41%
2½ to 6 in., lap welded	45%	32%	53½%	40½%	51%	38%

WROUGHT-STEEL PIPE LIST

Size, Inches	List Price per Foot	—Diameter in Inches— External	Internal	Thickness Inches
1	$0.17	1.315	1.049	.133
1¼	.23	1.66	1.38	.14
1½	.27½	1.9	1.61	.145
2	.37	2.375	2.067	.154
2½	.58½	2.875	2.469	.203
3	.76½	3.5	3.068	.216
3½	.92	4.0	3.548	.226
4	1.09	4.5	4.026	.237
4½	1.27	5.0	4.506	.247
5	1.48	5.563	5.047	.258
6	1.92	6.625	6.065	.28

SEAMLESS STEEL TUBING—Following net prices are for seamless mechanical tubing, cold drawn, round, .10 to .30 carbon, at New York warehouse in lots of less than 100 ft. or 100 lb.:

——Thickness—— Decimal	B.w.g. and Fractions	Outside Diameter in Inches— ⅛	¼	¾	½	1	1¼	1½
		Price per Foot						
.035″	20	$0.15	$0.16	$0.17	$0.18	$0.19	$0.21	$0.23
.049″	18	.17	.18	.19	.20	.21	.23	.25
.065″	16	.19	.20	.21	.22	.23	.25	.27
.083″	14	.20	.22	.23	.24	.25	.27	.29
.095″	13	.21	.23	.25	.26	.27	.29	.31
.109″	12	.22	.24	.26	.27	.28	.30	.32
.120″ or .125″	11	.23	.25	.27	.28	.29	.31	.33
.134″	10	.24	.26	.28	.29	.30	.32	.34

MISCELLANEOUS—Warehouse base prices in cents per lb.:

	New York	Cleveland	Chicago
Spring steel, light*	4.50	4.65	4.65
Spring steel, heavier	4.00	4.00	4.00
Coppered Bessemer rods	6.05	6.00	6.20
Hoop steel	4.50‡	4.00	4.15
Cold rolled strip steel	6.25	6.00	6.10
Floor plates	5.10‡	5.30	5.00
Cold drawn, round or hexagon†	3.40	3.65	3.60
Cold drawn, flat or square†	3.90	4.15	4.10
Structural shapes	3.30‡	3.00	3.10
Soft steel bars	3.25‡	3.00	3.00
Soft steel bar shapes	3.25‡	3.00	3.00
Soft steel bands	4.00‡	3.65	3.65
Tank plates	3.30‡	3.00	3.10
Bar iron (2.75 at mill)	3.24	3.00	3.00
Drill rod (from list)	60%	55%	50%

*Flat, $\frac{3}{16}$@$\frac{1}{2}$-in. thick. †Cold finished steel, shafting and screw stock. ‡250 to 3,999 lb., ordered and released for shipment at one time.

Electric welding wire, New York, $\frac{3}{32}$, 8.35c.; $\frac{1}{8}$, 7.85c.; $\frac{5}{32}$ to $\frac{1}{4}$ 7.35c. per lb.

METALS

Warehouse Prices in Cents Per Pound for Small Lots:

Copper, electrolytic, New York			15.50
Tin, Straits, pigs, New York			51.00
Lead, pigs, E. St. Louis	6.00	New York	7.75
Zinc, slabs, E. St. Louis	6.25	New York	7.75

	New York	Cleveland	Chicago
Antimony, slabs	12.75	13.00	14.25
Copper sheets, base	23.50	23.50	23.50
Copper wire, base	20.12½	19.62½	16.75
Copper bars, base	22.00	22.00	22.50
Copper tubing, base	25.00	25.00	25.00
Brass sheets, high, base	19.25	19.25	19.25
Brass tubing, high, base	24.12½	24.12½	24.12½
Brass rods, high, base	17.00	17.00	17.00
Brass wire, high, base	19.75	19.75	19.75

*At mill.

Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Aluminum ingots, 99%	25.00*	24.30	24.30
Zinc sheets (casks)	10.00@10.50	11.00	9.61
Solder (strictly)	32.25	30.75	31@34
Babbitt metal, delivered in case lots, New York, cents per lb.:			
Genuine, highest grade			67.75
Commercial genuine, intermediate grade			53.00
Anti-friction metal, general service			31.50
No. 4 babbitt (f.o.b.)			12.25
Nickel, f.o.b. refinery, Bayonne, N. J., cents per lb.:			
Ingots 35.00	Electrolytic 37.00	Shot 36.00	

*Delivered.

SPECIAL NICKEL AND ALLOYS—Price in cents per lb., f.o.b. Huntington, W. Va.:

Full finished nickel sheet (base)	52.00
Cold rolled nickel sheet (base)	60.00
Hot rolled rods, Grade "A" (base)	45.00
Cold drawn rods, Grade "A" (base)	53.00

Base price of Monel metal in cents per lb., f.o.b. Huntington, W. Va.:

Shot	28.00	Hot rolled rods (base)	35.00
Blocks	28.00	Cold drawn rods (base)	43.00
Cold rolled sheets (base)	50.00	Full finished sheets (base)	42.00

OLD METALS—Dealers' purchasing prices in cents per pound, f. o. b. cars, depending on quantity:

	New York	Cleveland	Chicago
Crucible copper	12.75 @13.00	12.00	11.75@12.25
Copper, heavy, and wire	12.00 @12.75	11.25	11.25@11.75
Copper, light, and bottoms	10.62½@11.12½	9.75	10.00@10.50
Heavy lead	5.00 @ 5.12½	5.25	4.50@ 5.00
Tea lead	3.50 @ 3.75	3.75	3.50@ 4.00
Brass, heavy, yellow	7.25 @ 7.50	7.75	7.25@ 7.75
Brass, heavy, red	9.75 @10.25	10.00	9.50@ 9.75
Brass, light	5.50 @ 6.00	6.25	6.25@ 6.75
No. 1 yellow rod turnings	7.75 @ 8.25	7.75	7.50@ 8.00
Zinc	3.25 @ 3.50	3.25	2.87½@3.37½

TIN PLATES—Charcoal—Bright—Per box.

		New York	Cleveland	Chicago
"AAA" Grade:				
IC,	14x20	$12.10	$11.95	$11.50
"A" Grade:				
IC,	14x20	9.70	9.90	9.50
Coke Plates—Primes—Per box				
100-lb.,	14x20	6.45	6.10	7.00
Terne Plates—8-lb. Coating—Small lots—Per box				
IC,	14x20	7.75@8.00	7.00	7.50

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.*	$0.10@0.13½	$0.16	$0.15
Cotton waste, colored, per lb.*	.09@ .13	.12	.12
Wiping cloths, washed white, per lb	.15½	38.00 per M	.17
Sal soda, per lb	.02	.02	.02
Roll sulphur, per lb	.027	.03½	.04
Linseed oil, raw, in 1 to 4 bbl. lots, per lb	.105	.105	.103
Cutting oil, about 25% lard, in 5 gal. cans, per gal	.65	.60	.60
Machine oil, medium-bodied (55 gal. steel bbl.) per gal	.30	.36	.36
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, 24c. per lin.ft. per inch of width for single ply.:			
Medium grade	30–10%	30–10%	35%
Heavy grade	25–5%	30–5%	30%
Rubber transmission, 6-in., 6 ply, $1.83 per lin.ft.:			
First grade	50%	50–10%	50%
Second grade	60%	60–5%	50–10%

*All waste in bale lots.

Comparative Warehouse Prices

New York	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars	per lb	$0.0325	$0.0325	$0.0324
Cold drawn shafting	per lb	.034	.034	.04
Brass rods	per lb	.17	.17	.16
Solder (½ and ½)	per lb	.3225	.31	.40
Cotton waste, white	per lb	.10@.13½	.10@.13½	.10@.13½
Emery disks, cloth, No. 1, 6-in. dia	per 100	3.10	3.10	3.10
Lard cutting oil	per gal	.65	.65	.65
Machine oil	per gal	.30	.30	.27
Belting, leather, medium	off list	30–10%	30–10%	40–5%
Machine bolts, up to 1x30 in., full kegs	off list	50%*	50%*	50%*

*List prices as of April 1, 1927.

MISCELLANEOUS—Continued

	New York	Cleveland	Chicago
Abrasive materials—Standard grade, in sheets 9x11 in., No. 1, per ream of 480 sheets:			
*Flint paper	$5.40	$5.56	$5.13
*Emery paper	10.71	11.90	10.71
†Emery cloth	27.84	27.85	27.84
Emery disks, 6 in. dia., No. 1, per 100:			
Paper	1.29	1.45	1.32
Cloth	3.10	3.55	3.05
Fire clay, per 100 lb. bag	1.00	.75	.75
Coke, prompt furnace, per net ton	Connellsville,		2.25@2.50
Coke, prompt foundry, per net ton	Connellsville,		3.25@3.75
White lead, dry or in oil	100 lb. kegs	New York,	13.25
Red lead, dry	100 lb. kegs	New York,	13.25
Red lead, in oil	100 lb. kegs	New York,	14.75

*4½ reams and under. †Less than 2 reams.

SHOP SUPPLIES

Discounts from new list dated Apr. 1, 1927, applying on immediate deliveries from warehouse stocks in New York and vicinity:

	Full Kegs or Cases
Machine bolts, square heads and nuts:	
Up to ¾ x 6-in.	55%
Larger up to 1 x 30-in.	50%
1⅛ and 1¼ in. dia.	35%
Carriage bolts:	
Up to ½ x 6-in.	55%
Larger sizes	50%
Coach and lag screws:	
Up to ½ x 6-in.	55%
Larger sizes	50%
Tap bolts, hexagonal heads	40%
Nuts:	
Hot pressed, square and hexagonal, blank or tapped, up to 1-in., incl.	55%
Cold punched, square and hexagonal, blank or tapped, up to 1-in. incl.	55%
Semi-finished, hexagonal, tapped, in packages, all sizes	40%
Case hardened, hexagonal, tapped, in packages, all sizes	30%
Washers: Deduct from list, per 100 lb	$3.50*
Rivets, button and cone head:	
Small, including ⅛-in. dia.	50–10%
Large (base) per 100 lb. net	$5.00†

Note—For less than full package quantities on bolts, screws, hot-pressed and cold-punched nuts, add extra of 10 per cent to list.
*Broken keg lots, $1.50 off list. †Broken keg lots, $6.50 net.

Machine Requirements and Industrial Construction

Equipment Wanted

D. C., Washington—A. L. Flint, General Purchasing Officer of the Panama Canal, will receive bids until Aug. 24, for pneumatic wood borers, etc.

Wis., Racine—Belle City Malleable Iron Co.—5 ton overhead crane, etc. (later) for proposed 1 story, 77 x 96 ft. addition to plant.

Opportunities for Future Business

Calif., Berkeley—California Electric Refrigeration Corp., Jerrold Ave. and Napeoleon St., Francisco, is having revised plans prepared for a 1 story factory at 5th St. and Dwight Way here. Estimated cost $40,000. Private plans.

Calif., San Luis Obisco—State Highway Dept., Sacramento, will receive bids until Sept. 5, for the construction of a maintenance station to include shop building. C. H. Purcell, Forum Bldg., Sacramento, Engr.

Conn., Bristol—E. Ingraham Co., 392 North Main St., is receiving bids for a 5 story, 50 x 162 ft. factory on North Main Estimated cost $100,000. M. J. Unkelbach, 52 Main St., New Britain, Archt.

Conn., Danbury — Danbury Industrial Corp., J. E. Pike, awarded contract for the construction of a 1 story, 65 x 200 ft., factory at Shelter Rock Rd. Estimated cost $55,000.

Conn., Hartford—M. S. Little Mfg. Co., 151 Park Ave., is receiving bids for a 1 story, 50 x 120 ft., addition to brass foundry. Estimated cost $40,000. W. W. Dolliver, Architect.

Ill., Chicago—American Forge Co., 2621 South Hoyne Ave., awarded contract for a 1 story, 80 x 140 ft. foundry at 2617-25 South Hoyne Ave. Estimated cost $50,000.

Ill., Chicago—Cameron Can Machinery Co., 240 North Ashland Ave., awarded contract for a 1 story 98 x 216 ft. addition to factory. Estimated cost $100,000.

Ill., Chicago—Container Corp. of America, W. Paepeck, Pres., 111 West Washington St., is having plans prepared for addition to factory at 900 Ogden Ave. Francisco & Jacobus, 360 North Michigan Ave., Archts.

Ill., Chicago—Syndicate, c/o M. Horwich, 11 South La Salle St., awarded contract for a 2 story, 140 x 180 ft. auto service building at Michigan Ave. and 26th St. Estimated cost $353,000. Noted July 19.

Ill., East St. Louis—St. Louis Air Transport & Terminal Co., c/o M. C. Steinberg & Co., 6625 Boatmen's Bank Bldg., St. Louis, Mo., is having preliminary plans prepared for the construction of an airport including hangars, shops, etc. Estimated cost $1,000,000. P. R. Love & T. P. Sultan, 6625 Delmar Blvd., St. Louis, Mo., Engrs.

Ind., South Bend—Studebaker Corp., awarded contract for a 2 story, 240 x 432 ft. factory at Franklin and Sample Sts. Estimated cost $100,000.

Ia., Des Moines—Des Moines Casket Co., 405 Southwest 8th St., manufacturers of caskets awarded contract for 100 x 135 ft. factory at Indiana and Main Sts. Estimated cost $40,000.

Md., Baltimore—Burn's Bottling Machine Works, 2329 Taylor St., manufacturers of automatic soda machinery, will build a 1 story, 40 x 60 ft., addition to plant.

Md., Baltimore—The Stieff Co., Wymans Park Driveway, manufacturers of silverware, will build an 80 x 180 ft. addition to plant.

Mass., Boston—Terkelsen Machine Co., 326 A St., South Boston, awarded contract the construction a factory addition also alterations to present plant.

Mass., Boston—Thompson Wire Co., Mildred Ave., Mattapan, awarded contract for the construction of a 1 story 55 x 125 ft. factory addition on Mildred Ave. to Clark & Smith Inc., 13 Temple St., Quincy. Estimated cost $40,000.

Mass., Brockton—Eastern Mass. Railway Co., 38 Chauncy St., Boston, will soon award contract for remodeling 1 story repair shop. Estimated cost $40,000. Private plans.

Mass., Natick—F. Kirby, Summer St., plans a 1 story 70 x 110 ft., service garage, repair shop and salesroom. Estimated cost $50,000. E. F. Aldridge, 761 Dudley St., Dorchester, archt.

Mass., Quincy—L. Grossman & Sons, 130 Granite St., will build by separate contracts a 2 story factory on Granite St. Estimated cost $40,000. Private plans.

Mass., Watertown—(Boston P. O.)—Watertown Electric Co., 7 Main St., awarded contract for the construction of service garage, repair shop and salesroom on North Beacon St. Estimated cost $50,000.

Neb., Lincoln—City, c/o T. H. Berg, Clk. has acquired a site and plans the construction of a municipal airport including hangars, shops, etc. Estimated cost $100,000. D. L. Erickson, City Hall, Engr.

N. H., Claremont—Howe's Garage, 57 Pleasant St., awarded contract for a 1 story, 100 x 125 ft. repair and service garage. Estimated cost $50,000.

N. J., East Orange—Scher & Albert Inc., 9 Clinton St., Newark, will build a 2 story, 60 x 110 ft. work shop, etc. at 19 A and 19 B. Harrison St. Estimated cost $65,000. F. G. Hasselman, 34 Prospect St. East Orange, Archt.

N. J., Elizabeth—Hitchings & Co., 1701 Spring St., greenhouse builders, taking bids for remodeling 2 story 70 x 200 ft. mill building. Estimated cost $150,000. C. G. Poggi & W. Bragdon, 275 Morris Ave., archts.

N. J., Irvington—Oakland Purchasing Co., c/o R. Nordin, Archt., 14 Park Place, Newark, is having plans prepared for the construction of a 1 story, 100 x 200 ft. garage at 316-18 Colt St. Estimated cost $150,000.

N. J., Jersey City—Crescent Aircraft Corp., O. J. Webster, Pres., 200 Broadway, New York, N. Y., plans the construction of an airplane factory on Droyers Point. Estimated cost $250,000. Architect not announced.

N. J., Newark—G. Jones, 24 Commerce St., Archt., is receiving bids for a 7 story, 52 x 116 ft. garage at 65-67 Clinton St., for Clinton St. Garage Inc., 247 Market St. Estimated cost $200,000. Noted Aug. 9.

N. J., Newark—Pioneer Iron Wks. Inc., L. J. Siegler, Pres. 317 Frelinghuysen Ave., plans construction of a plant. Estimated cost $45,000. Architect not announced.

N. Y., Brooklyn—Hoff Improvement Co., S. Cohn, Pres., will build a 100 x 131 ft. garage at Boardwalk and Neptune Ave. Estimated cost $40,000. B. A. Blassman, 44 Court St., Archt.

N. Y., New York—Harnet Realty Co., 250 West 57th St., will soon receive bids for a garage at Westchester and Pugsley Sts. Estimated cost $62,500. Cohen & Siegel, 45 West 57th St., Archts.

N. Y., New York—L. Held & Son, 810 East 168th St., will build a 1 story, 57 x 203 ft. garage at Whitlock and Lowell Sts. Estimated cost $40,000. H. Ginsberg, 222 East 42nd St., Archt.

N. Y., New York — Honora Building Corp., 1 Union Sq., will build a garage at White Plains Ave. and Waring Ave. Estimated cost $60,000. F. Wolfgang, 535 Tremont St., Archt.

N. Y., New York—M. Building Corp., B. Gass, Pres., 505 Tremont St., plans the construction of a 2 story, 75 x 100 ft. garage at Jackson Ave. and St. Mary's St. Estimated cost $50,000. Glick & Duma, 400 Fordham Rd., Archts.

N. Y., New York—Mindor Development Corp., S. Witkin, Pres., 11 West 42nd St., plans the construction of a 1 story garage at Delancey St. Estimated cost $65,000. M. Klein, 65 Court St., Brooklyn, Archt.

N. Y., New York—H. Perlman, 151 West 42nd St., plans 91 x 125 ft., service garage, Pugsley and Weslich Aves. Estimated cost $50,000. Siegel & Cohn, 45 West 57th St., archts.

N. Y., New York—J. Reitano, Jr., 827 East 22nd St., had plans prepared for the construction of 100 x 100 ft., service garage, at Lafayette Ave. and Whittier St. Estimated cost, $60,000. F. J. Ross, 4200 White Plains Ave., archts.

N. Y., New York—Weprin & Glass Building Corp., 145 West 27th St., had plans prepared for construction of 2 story, 68 x 168 ft., service garage, 179th and Cedar Sts. Estimated cost, $75,000. C. N. Whinston, 2 Columbus Circle, archt. Noted July 26.

Pa., Norristown—Spicer Mfg. Co., manufacturers of universal joints and drive shafts, has work under way on the construction of a 1 story addition to plant.

Tenn., Nashville — Farris Lumber Co., will build a lumber mill recently destroyed by fire. Estimated cost $175,000 to $200,000.

Wis., Milwaukee—Globe Steel Tubes Co., 1345 Burnham St., will build with own forces, 1 story 200 x 300 ft., factory addition at Burnham St. Private plans.

Wis., Milwaukee — International Harvester Co., 606 S. Mich. Blvd., Chicago, Ill., awarded contract for construction of a 3 story 108 x 302 ft., factory addition.

Wis., Wauwatosca—A. Leutz Co., awarded contract for the construction of a 3 story, 70 x 100 ft. factory at 61st and State Sts. Private plans.

Wis., Milwaukee—Wisconsin Machinery & Mfg. Co., 51st & Burnham Sts., awarded contract for addition to plant.

Ont., Hawkesbury—Hawkesbury Lumber Co. Ltd., plans the construction of a saw mill. Estimated cost $125,000.

Ont., Brantford—Bd. of Education, A. K. Bunnell, Secy., will receive bids until Aug. 31, for a 3 story, 75 x 120 ft. technical school including machine shop, mechanics shop, electric shop, etc. at Brant Ave. Estimated cost $185,000. F. C. Bodley, Temple Bldg., Archt.

Ont., Oakville—General Metal Services, Oshawa, awarded contract for a 1 story, 60 x 300 ft. metal factory on Kerr St. here. Estimated cost $75,000.

Ont., Toronto—Lee & Duggan, 621 Youge St., plans the construction of auto sales and service building at Youge & Gloucester Sts. Estimated cost $250,000. Architect not selected.

Ont., Mount Denis—First Brook Bros., 283 King St. E., Toronto, plans the construction of box factory here. Estimated cost $250,000. Chapman & Oxley, Northern Ont., Bldg. archts.

Ont., Toronto—Smith Bros, 188 Duke St., plans the construction of a motor body factory at Logan St. Estimated cost $150,000. Architect not announced.

Que., Montreal—Zetland Garage, Ltd., c/o A. J. Wright, Elec. Engr., 223 Sherbrooke St. West, soon takes bids for 7 story garage on St. Henry St. Estimated cost, $400,000. Private plans.